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Publication

MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF APPLICATIONS BY EACH OF
(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS
CROWN LANDS WITHIN THE YUKON TERRITORY AND
THE NORTHWEST TERRITORIES, and
(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY
THAT MIGHT BE GRANTED ACROSS CROWN LANDS
WITHIN THE NORTHWEST TERRITORIES,
FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE

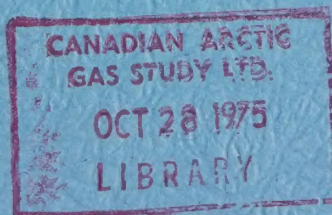
(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.,

October 21, 1975.

PROCEEDINGS AT INQUIRY

Volume 76



APPEARANCES:

Mr. Ian G. Scott, Q.C.	
Mr. Stephen T. Goudge,	
Mr. Alick Ryder and	
Mr. Ian Roland	for Mackenzie Valley Pipeline Inquiry;
Mr. Pierre Genest, Q.C.	
Mr. Jack Marshall,	
Mr. Darryl Carter, and	for Canadian Arctic Gas Pipeline Limited;
Mr. Reginald Gibbs, Q.C.	
Mr. Alan Hollingworth	for Foothills Pipelines Ltd.;
Mr. Russell Anthony,	
Prof, Alastair Lucas	for Canadian Arctic Resources Committee;
Mr. Glen W. Bell and	
Mr. Gerry Sutton	for Northwest Territories Indian Brotherhood and Metis Association of the Northwest Territories;
Mr. John Bayly	for Inuit Tapirisat of Canada and the committee for Original Peoples Entitlement;
Mr. Ron Veale and	
Mr. Allen Lueck	for the council for the Yukon Indians
Mr. Carson H. Templeton	for Environment Protect- ion Board;
Mr. David Reesor	for Northwest Territories Association of Muni- cipalities
Mr. Murray Sigler	for Northwest Territories Chamber of Commerce

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Yellowknife, N.W.T.,

October 21, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. SCOTT: Yesterday there was some reference to the draft environmental statement which Mr. Anthony thought had been marked as an exhibit in Whitehorse. It was apparently not marked as an exhibit. It's several volumes, Dr. Fyles tells me it's about a foot. Could I suggest that because it's hard to get, we should adopt the following procedure, that is, a number should be allotted to it and if counsel or any participants wish to inspect it, Dr. Fyles has a copy in our office here in Yellowknife and it can be examined. But we would prefer, for our own convenience, not to have it piled with the exhibits at this stage, so that a number should be given to it, to be available to be looked at in our office if anyone wishes to see it.

THE COMMISSIONER: All right.

(DRAFT ENVIRONMENTAL STATEMENT MARKED EXHIBIT 288)

MR. MARSHALL: Mr. Commissioner, I was wondering if I could get some indication from counsel as to whether or not they wish to have Mr. Williams and Mr. Dau attend this week for cross-examination? If so, I'll get on the phone to them and have arrangements made. I think in both their cases it's indicated that they might be required, so they're standing by.

MR. SCOTT: I think, Mr. Commissioner, Mr. Hollingworth said yesterday that

1 his people would not be able to get together the information
2 that they required to examine either of them, and
3 therefore we proposed that Mr. Williams should be
4 cross-examined with respect to the evidence he gave
5 on Friday when he appears on Arctic Gas' Panel 1 in
6 Phase 2, because he's on that panel.

7 MR. MARSHALL: That's fine,
8 I think.

9 MR. SCOTT: And that Mr. Dau
10 should perhaps, if there are questions to be asked
11 of him as a result of the financial information, could
12 be asked to attend that week and his examination fitted
13 in sometime during that week.

14 MR. HOLLINGWORTH: That is
15 essentially correct. I wanted to send Mr. Williams'
16 evidence to our snow road expert, Mr. Jarvis. I could
17 in fact, get Mr. Jarvis up here, but the way I calculated
18 it, it would be at least Friday before I'd be in a
19 position to ask questions of Mr. Williams, and inasmuch
20 as he will be back in any event on Phase 2 evidence,
21 and it is something that really relates to environmen-
22 tal matters, we thought it might be more appropriate
23 if I could cross-examine him at that time.

24 With respect to Mr. Dau, Mr.
25 Gibbs has not yet received that information. It was
26 delivered to our law office yesterday but Mr. Gibbs
27 was at Foothills all day. He'll have it this morning
28 but he doesn't expect to be in a position to cross-
29 examine on it for some time.

30 THE COMMISSIONER: All right.

Weedon & Parker
Cross-Exam by Marshall

MR. MARSHALL: Fine, sir.

I have a few more questions for Dr. Weedon.

ROBERT WEEDON,
WALT PARKER, resumed:

CROSS-EXAMINATION BY MR. MARSHALL (CONTINUED):

Q Dr. Weedon, turning to page 7510 of your evidence in the transcript at line 13 and following, you say:

"The essential difference of course with the Fairbanks alternative is that these various environments are traversed within and along the established transportation corridors rather than cross-country."

Sir, my information is that the two right-of-ways -- that of the Alyeska line and that of the proposed gas pipeline -- are in many areas somewhat divergent. Are you aware of that?

WITNESS WEEDON: Yes.

Q Specifically I'm told that over about 29% of the route they are separated by at least a mile.

A Yes.

Q That would be so, and further, of course, the segment south of Valdez would not be a common segment.

A Yes.

Q I'm not sure how many miles that is -- 40 miles or so? So even where the two lines are close and they are not close in many areas,

Weedon & Parker
Cross-Exam by Marshall

1 but even where they are close, they would not be on the
2 same right-of-way, would they?

3 A No, they would not be
4 on the same 54-foot right-of-way, that's correct.
5 However, the state's intention is that we try as hard
6 as possible to get whoever builds the Trans-Alaska
7 route to build it as close as possible to the existing
8 facility and route, and we have had conversations with
9 El Paso in the last several months, which indicate that
10 they are considering several of those portions of their
11 route, I am not sure at what stage in their deliberations,
12 you have cited the 29% varying by one mile or more, but
13 they have indicated their willingness to come closer
14 to the Alyeska oil pipeline right-of-way; and as you
15 know, I'm sure, the precise routing of that pipeline
16 will not be set, in fact, until construction starts.
17 Similarly with the oil pipeline.

18 Q Well, I think the figure
19 that I was quoting is based on what has been filed in
20 applications before the Federal Power Commission.
21 There are really two points: (1) the lines do diverge
22 over some 29% of the route, at least a mile; and then
23 (2) they will be on different right-of-ways. That's
24 correct, is it not?

25 A Yes, at this point in
26 time.

27 Q Now sir, then your
28 statement on page 7512 of your evidence, beginning at
29 line 22:

30 "...but again line inspection, line maintenance

Weedon & Parker
Cross-Exam by Marshall

1 and repair activities could be conducted
2 during any time of the year with virtually
3 no further damage to tundra or other vege-
4 tation communities, and this seems to me to
5 be a very significant environmen tal consid-
6 eration."

7 That statement, sir, would have to be qualified some-
8 what by those two matters that we were just discussing
9 -- diverg'ence of the right-of-way and the separate
10 right-of-way?

Parker, Weedon,
Cross-Exam by Marshall

1 A Is that a question,
2 Mr. Marshall?

3 Q Yes,,would --

4 A Yes, that is correct.

5 Q That is a qualification
6 that has to be read into this.

7 A Yes.

8 Q Well, sir, further on
9 page 751² you speak about soils and river hydrology.
10 You say "along the route of the Alyeska Pipeline
11 soils and river hydrology have been extensively studied
12 and are thoroughly understood." I was wondering,
13 sir, if you could perhaps provide through counsel
14 the list of these studies that you have indicated
15 exist.

16 A Yes, I can.

17 Q Would it be fair to say,
18 sir, that where the lines diverge, as we have discussed,
19 that it would be necessary to gather much of this
20 soils and river hydrology data?

21 A I am sure that where
22 there is a significant divergence, the constructing
23 company would have to do more detailed soil surveys,
24 true, but there were many soil surveys in the general
25 corridor that is now occupied by the Alyeska Oil
26 Pipeline or will be shortly occuppied, and therefore
27 because this region is a relatively well-known part
28 of Alaska, certainly from the Yukon, south, then the
29 soils are just in general terms much better known than
30 they are in many other more remote areas of the state.

Parker, Weedon
Cross-Exam by Marshall

1 WITNESS PARKER:

2 A Commissioner. Mr.

3 Marshall, could you qualify that last request as
4 to soils and hydrology data? The full information
5 would take several hundred pounds of documents.

6 Q I really just wanted
7 a list,

8 A Just a list of where the
9 documents were available?

10 Q Yes, the statement is
11 "that soils and river hydrology have been extensively
12 studied and are thoroughly understood," and I just
13 wanted a list of the studies that have been done.

14 A Okay.

15 Q I am instructed as well,
16 Dr. Weedon, that even where the lines would be adjacent
17 they are often in very different terrain types, do you
18 know that to be so? Specifically, to give you an
19 example, I understand in the Sag River area that
20 the two lines would have to be very different
21 terrain types.

22 WITNESS WEEDON:

23 A I can't personally confirm
24 that.

25 WITNESS PARKER:

26 A I don't understand why
27 particularly in the Sag River.

28 Q The information that I
29 had was through the Sag River Valley the oil line
30 would be on the floodplain whereas the gas line would

1 be at a much higher, at a higher elevation up the
2 side of the valley.

3 A That of course is the
4 choice at this moment. There is no particular
5 reason why floodplain burial techniques would not
6 work as well for a gas line as for an oil pipeline.

7 Q Perhaps I should ask this
8 question, Commissioner Parker --

9 MR. SCOTT: Before Mr. Marshall
10 does, Mr. Commissioner, I am just two or three minutes
11 behind this morning. Mr. Marshall asked the Commissioner
12 and Dr. Weedon to produce a list of all studies that
13 relate to the -- or produced the knowledge of soil
14 and hydrological conditions in the Alyeska corridor,
15 and our Alaskan guests showed some willingness to
16 comply with, I think, a modest reservation by the
17 Commissioner about the volume of the studies. I wonder
18 respectfully, sir, whether that is useful
19 material for this Inquiry. It may be useful for Mr.
20 Marshall to have it in order to prepare his submissions
21 before the Federal Power Commission, but I am not
22 certain that it is of any utility as far as this
23 Inquiry is concerned and obviously it contemplates a
24 great volume of material, much of which I would think
25 is in the public domain in the sense of being published.
26 Does Mr. Marshall require it at all?

27 MR. MARSHALL: Mr. Scott, I
28 think we got into the evidence of these witnesses in
29 a consideration of alternative corridors and one of
30 them that was under consideration was the Fairbanks

Parker, Weedon
Cross-Exam by Marshall

1 Corridor, and that is really what leads me into this
2 line of inquiry. The Inquiry has been considering
3 that corridor and in large measure the Alyeska route
4 follows that corridor and that is why I was interested
5 in that information. The reason I raise it is
6 because I understand, or I am instructed that these
7 matters are not considered, by my advisors, to have been
8 well studied or well understood at all, and they
9 are interested in knowing what leads the witnesses
10 to the opposite conclusion.

11 MR. SCOTT: Well, perhaps
12 it would not be too much of a burden and perhaps this
13 was what was intended, if a list of non-public titles
14 or something of that type be made available, but
15 anything else, surely, unless it is strictly relevant
16 is putting our witnesses to a very severe task.

17 MR. ANTHONY: Mr. Commissioner,
18 if I might -- my understanding of that request and
19 the way I anticipate that it would be resolved, is that
20 all the studies and reports that have been filed
21 before the F.P.C. are available to Mr. Marshall
22 through his associates and we wouldn't expect to
23 go through and refile and relist all of those
24 studies, I would think that if there was anything
25 beyond those studies and have been before the
26 F.P.C., that relates specifically to these comments
27 that he has made about the further studies, we would
28 be glad to get that information and make it available,
29 but we didn't intend to reassemble and refile all
30 the information that is already before the Federal
Power Commission.

Weedon & Parker
Cross-Exam by Marshall

1 MR. MARSHALL: It seems we
2 don't have any disagreement with Mr. Anthony.

3 MR. SCOTT: Well then -- well,
4 I guess the taxpayers of Alaska can bear the burden
5 then.

6 MR. MARSHALL: I can demonstrate
7 why I'm interested in this in other ways. These
8 gentlemen have made some reference to the Draft Environ-
9 mental Impact Statement that the Department of the
10 Interior have done and at Volume 6, page 839 -- or
11 part 6, I'm sorry, page 839, this statement is made,
12 and I'll read it and ask the witnesses whether or not
13 they agree with it:

14 "If this route,"
15 speaking of the proposed El Paso route,
16 "and method of transport are selected for
17 permit, a massive amount of field survey
18 will need to be done because of the extreme
19 variability of soil type and temperature and
20 ice (moisture) content, the available data
21 are not adequate for analysis concerned with
22 pipeline integrity. Similarly, vegetative,
23 climatic, water and engineering studies will
24 need to be made before pipeline construction
25 starts."

26 End of statement.

27 MR. ANTHONY: Excuse me, before
28 the question is put may I just clarify it? Those
29 comments were aimed to the proposed El Paso route or
30 the Alyeska oil route?

Weedon & Parker
Cross-Exam by Marshall

1 MR. MARSHALL: These comments
2 relate to the route that is proposed by El Paso for
3 a gas pipeline, which, as the witnesses have indicated,
4 is generally along the same route as being followed by
5 Alyeska.

6 MR. ANTHONY: Well, perhaps
7 I can get that clarified. My friend has just made the
8 point that the routes may not be the same and has
9 emphasized that point, and the comments in the transcript
10 note that along the route of the Alyeska Pipeline
11 soils and river hydrology have been extensively studied.
12 The comments that he makes now refer to a different
13 route which he has demonstrated as being somewhat
14 different. So perhaps that should be made clear.

15 MR. MARSHALL: Well, that
16 seems fair. I'll go back over it another way then.

17 Q Dr. Weedon, when you
18 made the comment about the soils and hydrology along
19 the Alyeska route being well-studied and well-understood,
20 did you mean that to apply as well to the proposed
21 route for a gas pipeline along such a corridor?

22 WITNESS WEEDON: A My point is this, that
23 wherever the two routes, pending any final alignment
24 of a gas pipeline route, wherever the two routes are
25 close together, very close together, a matter of a
26 few hundred meters, then the gas pipeline will be able
27 to take advantage of the massive amount of rather
28 detailed data that the oil pipeline has generated.

29 Where they diverge, then there
30 will have to be additional studies, and there will have

Weedon & Parker
Cross-Exam by Marshall

1 to be additional work done, probably just in front of
2 the lead bulldozer as it were. But this is true of
3 every route and my point, furthermore, is that the area
4 traversed by the proposed trans-Alaska route is in
5 general terms far better known than the so-called
6 interior route, for example, that is the Fort Yukon
7 route and so on, and many other parts of wild Alaska.
8 Hence the base from which the soils and hydrological
9 scientists will start is a much higher base of knowledge
10 in that area.

11 Q Well sir, where the oil
12 route and proposed gas route would diverge by more than
13 a few hundred meters, would you agree with the
14 statement in the draft Environmental Impact Statement
15 about the need for further work?

16 WITNESS PARKER: Mr. Commis-
17 sioner, perhaps I should answer that. Yes, we will
18 have available soil logs from some 400 miles of open
19 ditch/^{which} will be the greatest amount of sub-surface soil
20 information that has ever been obtained in the Arctic
21 at that time. We expect to be able to extrapolate
22 laterally from that information to some degree, except
23 in those areas where you have sporadic ice lenses,
24 in which case you never know where you're going to
25 encounter such a lens until you do come upon it. We
26 will also have the soil data from some 74,000 borings
27 for the vertical support members of the above-ground
28 section, which is also a vast amount of soil data for
29 the other 400 miles. Yes, we do plan to be able to
30 extrapolate a great deal laterally from the pipeline, and

Weedon & Parker
Cross-Exam by Marshall

1 we have that particular operation under way at present.

2 WITNESS WEEDON: I would like
3 to point out that my testimony mentions both soils
4 and river hydrology, and I think it's at least common
5 sense to me, not as a hydrologist but as a natural
6 scientist, that, stream gauges and other devices for
7 measuring stream flow along the areas crossed by the
8 trans-Alaska Oil Pipeline are, at the same time, giving
9 data on the seasonal flux of flows of volume in those
10 streams that will apply as well a mile upstream or
11 a mile downstream, or whatever modest distance you
12 wish to state, that the gas pipeline will traverse
13 those same streams. So I think that the river hydro-
14 logical data that is being generated at specific
15 crossings of the oil pipeline will be very useful.

16 Q To return to Commissioner
17 Parker's comments, do I understand correctly,
18 Commissioner, that this is data that will be available
19 and will enable you to conduct an analysis, but that
20 to this point, at least, you have not been able to conduct
21 such an analysis as to the suitability of the terrain
22 to be traversed by a gas pipeline through this area?

23 WITNESS PARKER: Mr. Commis-
24 sioner, that is not our particular job at this time.
25 It is the Gas Arctic who has made the proposal for
26 a buried gas refrigerated pipeline. We reserve the
27 right to make further judgments as to the suitability
28 of a refrigerated buried pipeline through any soil
29 conditions. We say that we have more soil information
30 in this particular corridor than we have in any other

Weedon & Parker
CrossExam by Marshall

1 extended transportation corridor in Alaska. As I
2 just pointed out, when the pipeline is finished we
3 will have more sub-surface soil data probably than for
4 any place in the Arctic and sub-Arctic regions, mainly
5 because it will be the only time that there has been
6 this much soil surface activity. Almost all Soviet
7 pipelines until now have been above-ground. What
8 data we have, they have accumulated has not been
9 available to us. So we feel that we are operating
10 from a position of strong strength of knowledge in
11 this particular corridor.

12 Q Dr. Weedon, on page
13 7513 of your evidence you speak at line 9 about
14 cumulative effects, and I take it that would be
15 cumulative effects of both a gas and an oil pipeline
16 were they build in the same corridor?
17
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30

Parker, Weedon
Cross-exam by Marshall

1 A Yes.

2 Q We may have gone into this
3 in the session in Whitehorse, but do I understand
4 correctly that the State has not done a study of
5 what the cumulative effect would be of having two
6 such facilities within a common corridor?

7 WITNESS PARKER:

8 A Commissioner. Mr. Marshall,
9 we have conducted some studies which is based primarily
10 on the data which Gas Arctic has furnished so far,
11 and we have not completed those studies. The relation-
12 ship between the hot oil pipeline and a refrigerated
13 pipeline as to how far apart they would be, we are
14 probably no farther along than making that determination
15 than is anyone else at this particular point in
16 history. However, we are sure that that distance
17 is not going to be far enough to severely impact the
18 concept that the two pipelines can generally parallel
19 each other. I think we are talking in terms of
20 whether they need to be fifty feet, 100 feet or 150
21 feet apart in order that the heat regime of one will
22 not impact upon the refrigeration regime of the
23 other, but nobody has furnished us data in this
24 regard and we are just beginning to acquire that type
25 of information ourselves.

26 Q If I understand correctly
27 the State doesn't have enough information at this
28 point to enable it to determine how close the two
29 facilities could be together, but you are in the
30 process of acquiring that sort of information?

1 A Yes, I would also point
2 out that the State does not have enough information
3 on the prime route to make any judgment as to the
4 suitability of the proposal across State lands
5 on the Gas Arctic Prime Route.

6 Q Sir, with respect
7 to the Fairbanks corridor, would it follow that if
8 you don't have enough information yet to determine
9 how close together a gas and an oil line should be,
10 that you don't have any environmental assessment as
11 to what the cumulative effect of two such facilities
12 would be?

13 WITNESS WEEDON:

14 A It is the state's position
15 that the two lines shall be as close as they possibly
16 can. We do not know how close that is, whether it is
17 a matter of totally adjacent rights-of-way, whether
18 it will make a difference in some areas of fifty
19 feet or a quarter of a mile or a mile. We are, and
20 I think, Mr. Marshall, the lines following the one
21 you stated, you will see that the State of Alaska
22 has made its best judgment on the basis of the
23 degree of certainty that we can enjoy at the present
24 time, both about all of the alternatives posed to us.

25 As we become more fixed
26 with respect to the exact position of any of the
27 alternatives, then we can go from that present level
28 of general judgment to a more specific judgment, and
29 as I want to indicate, our thrust will be to work
30 with the successful applicant in getting the precise

1 alignment that is most beneficial to the State
2 at large, and if this is the TransAlaska line, that
3 positioning, I am quite confident will be very close
4 to the TransAlaska oil pipeline.

5 Q Well, Dr. Weedon and
6 Commissioner Parker, I am led into this because of the
7 inclusion in the Pipeline Guidelines of a reference
8 to a -- of a corridor and there has been some dis-
9 cussion before the Inquiry about what is meant by a
10 corridor and whether a corridor concept is valid or
11 not valid and we have had a bit of evidence on that,
12 and we expect that we will probably have quite a bit
13 more. The issue that seems to be under debate is
14 whether or not it makes environmental good sense
15 to group communications and transportation facilities
16 very closely together or whether it makes better
17 environmental sense to separate them widely, that
18 is what leads me into this line of questioning.

19 Now, I take it from your
20 comments that the State of Alaska considers it is
21 best to group them closely, as close as possible,
22 is that fair to say?

23 A Certainly --

24 Q -- with a gas and an
25 oil line?

26 A Certainly in this
27 particular case, yes. It is the same point of
28 origin and the same prospective point of departure
29 within forty miles.

30 Q Yes, now what I am interest

Parker, Weedon
Cross-exam by Marshall

1 in is whether or not in reaching that conclusion the
2 State had any specific studies done as to what the
3 cumulative environmental impact might be of having
4 two facilities quite close together.

5 In other words, what is the
6 opinion based upon?

7 A Well, as I said, the
8 opinion is based on the best judgment we can
9 render on the basis of the information available,
10 and since we cannot, you know, it is essentially,
11 Mr. Marshall, you are searching for whether the
12 impossible has been done, and no, it has not been
13 done.

14 Q Perhaps our session
15 dealing with corridor concepts is going to be quite brief,
16 sir, I have been told it is the impossible.

17 WITNESS PARKER:

18 A Mr. Marshall, the
19 State's position is simply that there will be less
20 impact upon wildlife resources in the several
21 provinces that are crossed by the TransAlaska line
22 at this time, less impact upon fisheries and so forth,
23 by pairing the two pipelines together than by
24 separating them. We have no reason to believe that
25 this concept is not correct, especially, if, as you
26 say, the gas pipeline can be buried throughout
27 its entire route.

28 A good deal of the debate
29 about the oil pipeline and its relationship to
30 game species was occasioned by the necessity to build

above ground. Steps have been taken along the pipeline corridor to ensure that migrations will proceed as uninhibited as possible as we have testified.

Getting back to the testimony on corridors, if you care to rehash that again, it is probable that the point was not made strongly enough, that it is not the simple presence of the facility in the corridor that brings about your cumulative effect, but it is the traffic along that corridor that creates the eventual cumulative effect. In other words, when you speak of the relationship of roads to caribou or reindeer, it is not just the road as an object, but the traffic which the road brings that is a part of the cumulative effect, and it is our determination thus far, that the cumulative effect of a gas pipeline will not bring sufficient other intrusions into this particular corridor to have any further effect than is occasioned by the oil pipeline except for stringing out the period when people will be in that particular part of the country is our best judgment on it.

Weedon & Parker
Cross-Exam by Marshall

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2
3
4 Q I guess what I get back
5 to is this, is it really just a judgment call ^{that's it} that the
6 cumulative effect would be within acceptable limits,
7 as opposed to having been based on a series of
8 scientific studies or experiments?

9 WITNESS WEEDON:
10 A I think that's a fair
11 statement.

12 Q At page 7513 at line
13 18 you said -- you deal with the construction of
14 new facilities and duplication of facilities and you
15 say:

16 "...but will allow the construction of,"
17 excuse me --

18 A "the conservation
19 of scarce resources"?

20 Q
21 "...will allow the conservation of scarce
22 resources, since construction of new facili-
23 ties will be minimized."

24 I was wondering specifically what facilities you
25 thought would not need duplication if both an oil and
26 gas line were built close together?

27 A Mr. Parker?

28 WITNESS PARKER: Primarily
29 the access road, the camps, or at least, the campsites
30 which would be utilized for construction, hopefully
there could be some duplication of facilities regarding

Weedon & Parker
Cross-Exam by Marshall

1 pump stations so that the pump stations would be grouped
2 as closely as possible in order that those state
3 services that were necessary could be grouped, and
4 the general range of public services which the state
5 must furnish, simply because industry is there, would
6 also be located in one geographical area.

7 Q You did give us some
8 description of some of the facilities. I think it
9 was a thin work pad that you described, and I was
10 wondering whether or not you were generally satisfied
11 that the facilities that are being built are being
12 built to sufficiently high standards to enable their
13 continued use throughout the oil pipeline construction,
14 and then still leave them serviceable for other needs
15 thereafter?

16 A That would be a matter of
17 time. If the work pad is allowed to sit for several
18 years without maintenance, why it would require some
19 repair. A thin work pad is expected to degenerate
20 over a period of time, and has been constructed to
21 do so. We did not feel that we could utilize
22 scarce gravel resources requiring higher standards
23 until a decision has been made on which route will be
24 followed.

25 Q Just dealing with gravel
26 for a moment, I understand that there is already a
27 serious gravel shortage in some areas where the Alyeska
28 line is under construction.

29 A There is a serious gravel
30 shortage throughout the Alaskan Arctic and sub-Arctic.

Weedon & Parker
Cross-Exam by Marshall

1 The gravel resources north of the Brooks Range along
2 the Alyeska route are probably the greatest gravel
3 resources still in the Alaskan Arctic. So there is
4 no particular shortage of gravel north of the Brooks.
5 It is in the areas south of the Brooks that you begin
6 to run into more problems. However, there is sufficient
7 gravel to accomplish the task, and it's a matter of
8 how far you have to go to get it, and how much more
9 country that you wish to disturb in obtaining it.

10 We know how to utilize the
11 rivers along the present route, which is a big plus.
12 We have mining plans already established for those
13 rivers, and we -- the same problem is going to occur
14 on any route, gravel will always be a problem no matter
15 what route you take.

16 Q Gravel is being taken,
17 in some cases, from the river valleys, is it, gravel
18 bars in the rivers?

19 A Yes, that's the most
20 common source of gravel in the interior and in Arctic
21 Alaska.

22 Q In your judgment, sir,
23 have satisfactory techniques for the extraction of
24 the gravel been worked out?

25 A Yes.

26 Q Perhaps you could just --

27 A If you're referring to
28 the gravel in the river bars.

29 Q Yes. Perhaps you could
30 just describe how those -- what those techniques are

Weedon & Parker
Cross-Exam by Marshall

1 and how they're being employed.

2 A The general technique
3 is to dyke off the area where gravel is being extrac-
4 ted and after the gravel extraction is completed, to
5 smooth the area out and then, at that period of high
6 water, when there will be the least impact to fish
7 resource, to break the dykes and allow the river to
8 re-establish its natural regime.

9 Q So that any silt emptied
10 into the river at a time when it has a naturally high
11 silt content, is that --

12 A No, it's not based on
13 silt content, it's based on that period when the
14 fish will be absent.

15 Q I see. Sir, I was wonder-
16 ing whether or not you agreed with the assessment in
17 the Draft Environmental Impact Statement pertaining
18 to gravel at page 856 and 7 of the same volume I
19 referred to earlier. The statement is made:

20 "The gravel requirement for construction of
21 the oil pipeline will very likely carry the
22 total gravel commitment beyond reasonable
23 and acceptable limits in some areas. The
24 gravel requirement for this alternative would
25 further stress the stream systems supplying
26 the gravel. The ability of the stream flood
27 plains to supply this gravel without sustaining
28 serious irreparable damage is probably one of
29 the cool environmental issues affecting any
30 decision to select this alternative to the

Weedon & Parker
Cross-Exam by Marshall

1 proposal action."

2 There they're dealing with the proposed action, they're
3 speaking about this gas pipeline.

4 The word in the document is
5 "C-O-O-L", sir, I don't know what that means.

6 I was wondering whether
7 you're subject to some confusion over the use of the
8 term "cool", whether you agreed with the assessment
9 contained in this Draft Environmental impact statement?

10 A Oh, I don't expect
11 to accept any responsibility for editing Interior's
12 documents. I don't know what they put that word in
13 there for. The problem within the streams is manageable
14 for the streams that will be most severely impacted.
15 The Sagavanirktak, the Atigun, the Koyukak and it's
D 16 Dietrick middle and south forks, and the Tanana River.

17
18 the Delta River, the Low River, these will be the
19 streams where we primarily will be seeking large
20 sources of gravel. We will be dependent upon upland
21 sites for the rest of the gravel sources. Hopefully
22 the gravel needs will not be large enough that we would
23 have to open up new sites, but will utilize the exist-
24 ing ones.

25 Q Do I take it that your
26 preference is for gravel withdrawal from the river
27 sites rather than the upland sites?

28 A Yes.

29 Q Why is that, sir?

30 A That has been the state

Weedon & Parker
Cross-Exam by Marshall

1 position for the past 18 months. It's based on the
2 evaluation of some 800 material sites along the Alaska
3 Pipeline, that I was responsible for evaluating, and
4 it was the best judgment of my staff and myself that
5 the stream sites impacted less upon the environmen t
6 than the upland sites.

7 MR. MARSHALL: Mr. Commissioner,
8 you may recall that when the evidence of the panel was
9 being led by Mr. Anthony, he had Dr. Weedon give his
10 evidence and then he broke for Commissioner Parker's
11 evidence, then he had Dr. Weedon return to read in the
12 statement that the State of Alaska had filed with the
13 Federal Power Commission. I think the last part
14 of Dr. Weedon's evidence consisted of that, if I'm not
15 mistaken, and I was wondering whether or not that's
16 a matter that's really being furnished to the Inquiry
17 for informational purposes, or whether it's intended
18 that it be evidence that we should be cross-examining
19 on? Perhaps Mr. Anthony can assist on this point.

20 MR. ANTHONY: I think I'm not
21 exactly sure what the thrust of the distinction is.
22 We asked as a courtesy to this Inquiry we, as a matter,
23 have on record the position of the State of Alaska for
24 information. I would think that most of the detailed
25 questioning about that route and about that proposal
26 is best argued before the Federal Power Commission
27 because that's where the evaluation is to take place.

28 I thought that the statement
29 was in general terms enough to describe the general
30 environmental considerations that made the state come

Weedon & Parker
Cross-Exam by Marshall

1 to that position, and I think that's really the source
2 of the questioning that we've been following for the
3 last little while, and if he wishes to proceed on that
4 basis, it's fine. I think that if he wishes to proceed
5 into the El Paso versus Arctic Gas proposal, I think
6 that would be inappropriate at this Inquiry.
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Parker, Weedon
Cross-Exam by Marshall

1 MR. MARSHALL: Well, sir,
2 the difficulty, I suppose, that has presented us
3 is that we have given consideration to a Fairbanks
4 alternative corridor and that is in evidence and much
5 of the El Paso - Arctic Gas debate is in some sense
6 relevant because of that. Really, I am quite
7 prepared to leave the rest of Dr. Weedon's evidence
8 simply on the basis that he has simply stated what
9 the state's position is and we need not cross-
10 examine on it. It is not evidence of the facts
11 of the matters that Dr. Weedon has spoken to in that
12 statement. In other words, he is just outlining
13 what the state's position in and we can simply
14 leave it at that.

15 MR. SCOTT: Well, surely ,
16 Mr. Commissioner, that is a little dangerous, if
17 what Dr. Weedon said expresses his own opinion, or
18 incorporates his own opinion, or represents his
19 own opinion, it should be cross-examined upon,
20 because it may be utilized as his own opinion. If on
21 the other hand he was reading something about which
22 he has no views or about which he doesn't agree, well
23 then obviously we don't have to pursue it, but if
24 it represents his own opinion, it is evidence before
25 the Inquiry and should be examined upon.

26 MR. ANTHONY: Mr. Commissioner,
27 one further comment, if I may. I anticipated that
28 that evidence along with the rest of Dr. Weedon's
29 evidence could be discussed at this Inquiry in the
30 context of comparing alternate routes and to that

Parker, Weedon
Cross-Exam by Marshall

1 extent I think that anything that Dr. Weedon or
2 Commissioner Parker said should be cross-examined,
3 so that when we are comparing one route to another
4 I think that it is appropriate and should be pursued
5 as far as Mr. Marshall wishes to pursue it. The
6 question that I think would be inappropriate if we
7 got into an argument over the El Paso proposal
8 specifically as compared to the Artic Gas proposal
9 I think that would be inappropriate. But if
10 Mr. Marshall has any questions about the Fairbanks
11 alternative route, then that, certainly, is
12 before this Inquiry and Dr. Weedon should be questioned
13 on it if Mr. Marshall has any further questions.

14 THE COMMISSIONER. Well, I
15 think that if you have got any questions then you
16 should go ahead and ask them, Mr. Marshall.

17 MR. MARSHALL: Fine, sir.

18 Q Dr. Weedon, turning to
19 page 7545 in the transcript -- it appears at 7445 --

20 A Excuse me, Mr. Marshall,
21 I don't have that -- 7545?

22 Q Yes.

23 A I just don't have that
24 in front of me. Yes.

25 Q On the fourth line, and
26 I take it this is in reference to the proposed line
27 along the North Slope of Alaska Arctic Gas. Quote:

28 "This 200 miles has not been touched up to
29 now." Endquote

30 I gather, sir, from our discussion the other

Parker, Weedon
Cross-exam by Marshall

1 day that this is perhaps an overstatement in that
2 there have been a number of activities that have
3 taken place along this area over the last hundred
4 years. The whaling activities, for example, the
5 DEW line activities, the hunting activities that
6 we discussed yesterday.

7 A That is correct, the
8 hunting activities have left essentially no mark
9 as far as can be determined. The DEW line and
10 the other permanent improvements, the settlement of
11 Kaktovik are all along the immediate coast.

12 Q One of my advisors
13 said surely the hunter's bullet is the ultimate
14 impact to the caribou. In that sense, surely it leaves
15 a mark, don't you agree?

16 A If you want to focus
17 on the individual, certainly.

18 Q Now, sir, further down
19 in line 10 and 11 you say:

20 "It is further felt that such an intrusion
21 would run counter to established Congressional
22 policy as expressed in the Alaskan Native
23 Claims Settlement Act."

24 The law of the United States, at the moment, and until
25 such time that it is changed, if it is changed, would
26 allow such a development, would it not?

27 A The specific law as it
28 relates to the Arctic Wildlife Range would allow a
29 Secretary to take this action, that is correct,
30 however, the statement still as it stands is still true

Parker, Weedon
Cross-exam by Marshall

1 that in the Alaskan Native Claims Settlement Act,
2 Congress established as one of its goals and policies
3 that a very large area of federal land within
4 Alaska should be studied for inclusion as parks,
5 refuges, wild and scenic rivers and so forth.

6 Q Sir, at the bottom
7 of the page you say in the last two lines,

8 "...such as damage to and intrusion upon
9 wildlife habitats will be only incremental
10 to the effects already caused by the
11 Alaska oil pipeline."

12 I think we probably dealt with this, but that represents
13 a judgment call and it is not based on scientific
14 studies as to what the incremental effects will
15 be.

16 A You are trying very
17 hard to make me degrade this to just a judgment
18 call, and it is just a judgment and it is based upon
19 the best of the evidence that is available scientifically
20 up to this point. All I cannot say, in all honesty,
21 is that on a mile by mile basis we have quantitatively
22 tallied the prospective changes to the environment
23 of the TransAlaska oil pipeline and added to those
24 in a quantitative sense, the prospective changes
25 from the gas pipeline and then seen what that total
26 is. We have not done that.

27 Q Well, you say at page
28 7546, line 61 to 19, just that, don't you? You
29 say:

30 "The aggregate effect of the oil and gas

Parker, Weedon
Cross-Exam by Marshall

1 pipelines is less than would be the
2 case for a Trans-Canada gas pipeline and a
3 Trans-Alaska oil pipeline."

4 A Yes.

5 Q How have you arrived
6 at that judgment then?

7 A By weighing in the
8 best way we can what is obvious to us.

9 WITNESS PARKER:

10 A Mr. Marshall, for
11 some 25 years we have had a Wildlife Management
12 Institute at the University of Alaska and this
13 in combination with the Alaskan Department of Fish
14 and Game which has existed since statehood,
15 and research is continued forward from its predecessor,
16 federal agency, forms the core of the information that
17 Dr. Weedon is referring to.

18 Dr. Weedon, of course, is a
19 professor at the Wildlife Management Co-operative Institute
20 and I have been associated with that since its
21 inception, in one way or another, and we have been
22 reviewing studies from all over the world on the
23 intrusion of roads, railroads, and other forms of
24 human intrusion into wildlife habitat. I guess that
25 is what we are bringing to this judgmental factor, is
26 simply as best we can the compendium of a quarter of
27 a century of research on the part of several dozen
28 individuals. I think that that is probably all
29 that anyone can bring to it at this time.

30 Certainly along the pipeline.

Parker, Weedon
Cross-Exam by Marshall

1 corridor we have encountered a wide range of wildlife
2 problems, as I pointed out in my earlier testimony,
3 and these range all the way from friendly wolves and
4 friendly bears, primarily, the main problem has been
5 the taming of the animals by the construction crews.

6 Whether it is better to have tamer feral
7 species -- I realize that there is a dichotomy in
8 that statement, but I will stick with it, whether it
9 is better to have tamer feral species along one
10 corridor than to have less tame feral species along
11 two, has got to be a judgmental factor because I don't
12 think that you are going to be able to come up with the
13 kind of telemetering devices that are going to give
14 you the kind of scientific information that you
15 are after.

16 Q Well, Dr. Weedon and
17 Commissioner Parker, I respect your judgment about
18 these matters. The difficulty I am faced with is
19 this, that my advisors do not share the judgements.
20 The scientific people involved in appraising these
21 things for Arctic Gas have conducted a number of studies
22 and their results seem to be in divergence with the
23 opinions that have been expressed.

24 Now, they want to test your
25 opinions by reference to the materials that you are
26 relying upon in support of the opinions that are
27 stated. Now, I appreciate that collectively you have
28 the benefit of research that has been done over
29 a number of years in Alaska. What my advisors would
30 like to have an opportunity to do is to be directed to

Weedon & Parker
Cross-Exam by Marshall

1 MR. MARSHALL: Well, they've
2 been much more specific than that, I think, sir, in
3 many areas.

4 MR. ANTHONY: Perhaps my friend
5 can pursue that on page 7546 , they stated "that to the
6 extent that the sharing of facilities is possible, the
7 aggregate effect of the two lines will be less." Now,
8 if my friend wishes to challenge that specific statement
9 that sharing of facilities does not necessarily do that,
10 they're talking here about airports and roads, then he
11 may ask that specific question; but I think the
12 general comment of whether or not the synergistic
13 study has been done on a quantitative analysis has
14 already been answered, and there hasn't been.

15 MR. MARSHALL: I haven't
16 asked him about that, I don't think, sir. I just want
17 to know these statements, some of them more specific
18 than others, what it is they're based upon. Now perhaps
19 in the case of the witnesses the only answer I'm going
20 to get is that that just represents their judgment based
21 on all their experience and professional training.
22 That simply represents it, there's nothing specific
23 they can direct me to. If that's the case, then that's
24 fine. If it's something in the Department of the
25 Interior draft Environmental Impact Statement that they
26 are using as a basis of their opinion, I want to know.
27 If it's some other specific document, I want to know
28 as well. I think I'm entitled to get that sort of
29 information.

30 MR. SCOTT: Aren't we being

Weedon & Parker
Cross-Exam by Marshall

over-lawyered on all sides this morning? Surely the solution is to allow Mr. Marshall to ask the question. The panel will answer it if they can. I'm sure they'll say honestly they can't if they can't. That's about as far as we can go.

MR. HOLLINGWORTH: My observation, sir, are not these witnesses like all witnesses called upon to deliver a list of documents upon which they're relying in giving their evidence? That would be Mr. Marshall's answer.

THE COMMISSIONER: Well, Mr. Marshall, why don't you just carry on because this argument isn't getting us anywhere.

MR. MARSHALL: Well, sir, I think there are a couple more counsel who haven't had an opportunity to get their name on the record yet today. Maybe they would want to say something.

Q Turning to page 7547 near the middle of the page, line 17 to 19, the following statement is made:

"Particularly important is the lesser damage a Trans-Alaska Pipeline would cause to the fishery resources of the north."

I was wondering, Dr. Weedon, if you could provide me with the documentation that is relied upon in support of that statement?

WITNESS WEEDON: Yes, I can.

Q I gathered from your comment the other day that you hadn't examined those

Weedon & Parker
Cross-Exam by Marshall

1 volumes of the Biological Report series that pertained
2 to the fisheries in Alaska, is that right?

3 A As I told you yesterday,
4 I have looked at those volumes. I'm aware generally of
5 what they cover, but I certainly haven't memorized all
6 of their contents or references.

7 Q On page 7549 near the
8 bottom you say, beginning at line 24:

9 "We do know, however, that the first major
10 disturbance of wilderness character is by far
11 the most important."

12 I suppose that you'd agree with me that it's really a
13 function of what the disturbance is and the magnitude
14 of that disturbance.

15 A Yes, and I spoke of
16 a major disturbance, which of course is a very general
17 word; but I was speaking of major disturbances.

18 Q Commissioner Parker,
19 you mentioned when you were testifying in Whitehorse
20 that work was going to be undertaken by the state
21 studying the area from Valdez to Gravena, and I think
22 you were just about to embark on that, and I was
23 just wondering whether or not you had carried out the
24 work.

25 WITNESS PARKER: Yes, Mr.
26 Marshall, we did a preliminary reconnaissance on that
27 route, but very preliminary, and we have not had the
28 resources to follow up yet in detail; the State Pipeline
29 Office, however, is continuing with the -- as much
30 survey as it can do in the office and accomplish its

Weedon & Parker
Cross-Exam by Marshall
Cross-Exam by Veale

1 other tasks, and I'm afraid that a further on-the-ground
2 studies are going to have to wait until spring now,
3 because of the snow in the high passes.

4 MR. MARSHALL: Those are all
5 my questions, sir.

6 MR. SCOTT: Mr. Veale perhaps
7 might be next, Mr. Commissioner, and we'll revert to
8 our usual order.

9
10 CROSS-EXAMINATION BY MR. VEALE:

11 Q Mr. Weedon, there's been
12 a great deal of discussion in your evidence about
13 worst case statistics, and I would just wish to
14 clarify, if I understand "worst case" in the sense
15 that you mean it in your evidence. I've been advised
16 that there are two types of models, statistical models
17 and mechanical models, and that in cases where the
18 descriptive statistical analysis does not exist, a
19 mechanical model is used, and on that basis you've
20 arrived at the worst case situation that seems to be
21 presented at various instances in your evidence. Is
22 that correct? Is my understanding correct?

23 WITNESS WEEDON: I wish you
24 would re-state the question, describe the difference
25 between your statistical model and mechanical model.

26 Q Well, you're trying to
27 predict the outcome of placing a gas pipeline on the
28 North Slope, and I gather you've taken the position that
29 all the evidence is not in for various disruptive
30 factors, and instead of taking all the hard scientific

Weedon & Parker
Cross-Exam by Veale

1 data when you talked about worst case situations, and
2 you in fact do not have all the hard scientific data,
3 therefore you use a mechanical model to arrive at
4 what you describe as a worst case.

5 A Well, I think to put it
6 into a specific instant, I believe that I used that
7 phrase with reference to potential losses of waterfowl
8 in the in-shore areas of the Arctic Coast, and there
9 the estimate was based on an assessment of the
10 -- of a possible spill of a toxic substance of major
11 size, and that coming at a time when the maximum number
12 of birds in the normal migration season were present
13 in the environment in which that oil or other toxic
14 substance was spilled; and so you're talking basically
15 about a set of probabilities. That is how you
16 build the worst case. Obviously you would have to
17 touch the careful line between what is possible and
18 where you can calculate probabilities, and what then
19 spills over into the remote possibility or impossible.

20 Q So you're using it as
21 a predictive tool?

22 A That's correct.

23 Q And it's not necessarily
24 any less valid than a statistical model; it just doesn't
25 have all the, necessarily same input.

26 A As you say, we are forced
27 in the north constantly to go beyond experience. We
28 do not have any experience on which we can base a
29 judgment that spills of a certain substance will occur,
30

Weedon & Parker
Cross-Exam by Veale

1 with certain frequency, simply because we haven't been
2 using substances that long, pumping crude oil to the
3 surface that long and so on.

4 Q Commissioner Parker,
5 I was wondering if, in your evidence you indicated that
6 roads and pipelines do not necessarily follow the
7 same alignment, and I was wondering if there are
8 any indications you could give us that the gas pipeline
9 in the case of the part in which it follows the
10 Alyeska line and down the Fairbanks corridor and the
11 Alaska Highway, would the pipeline in fact be able
12 to follow the general alignment of the highway?

13 WITNESS PARKER: The Alaska
14 Highway from Fairbanks to Dawson Creek?

15 Q Correct, as well from
16 Prudhoe Bay.

17 A Oh, very well. Well the
18 Alaska Highway in our context ends at Fairbanks and
19 from Fairbanks north we haven't given it a formal name
20 so we refer to it as the Fairbanks-Prudhoe Highway.
21 But yes, there is no reason, no engineering reason why
22 the gas line cannot generally follow the road. The
23 reasons where it might diverge would be based upon the
24 economy of the line being able to diverge from the
25 road, due to not having to maintain a road grade, and
26 therefore being able to short cut across certain
27 sections as the oil pipeline does, and also in a case
28 or buried pipeline, you are always seeking for thaw
29 stable soils and thaw stable soils give you your
30

Weedon & Parker
Cross-Exam by Veale

1 highest degree of environmental safety, at least in
2 our present concept of pipelines they do. Therefore
3 you are always going to seek within a certain route
4 alignment for that,
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Well, you can normally expect

1 to get your supplies in, this year was an exception in
2 that it was very difficult to get barges east of
3 Barrow, but it has been the normal experience in
4 the past that you could expect to make it once
5 you were prepared to wait for the ice to clear.
6 There are expenses of course in this in that if
7 the barges have to wait at Barrow for a considerable
8 period, why you start to lose your economies of
9 barge transport, evaporate with each day, you must
10 wait and pay crewtime.

11 The road normally can be
12 kept open year round and you can roll freight from an
13 ice free port to Prudhoe Bay year round if you are
14 willing to make maintenance costs for snow clearance.

15 Q Did you have any information
16 with respect to the comparative costs between barge
17 transport and highway transport?

18 A I have no current tariffs
19 that I could furnish you on that. Anyone interested
20 in coming up with that information could obtain it
21 easily simply by researching the current tariffs.

22 Q In your experience, are
23 there other positive advantages associated with an
24 established highway system in the construction and
25 maintenance of a pipeline?

26 A Yes, the advantages are
27 the reliability and the frequency of access for
28 supplies and equipment. It simply makes it much
29 easier to mobilize and keep to a tight construction
30 schedule. We, as I said before in previous testimony,

Parker, Weedon
Cross-exam by Veale

1 examined the alternatives early on in the game, and
2 when I say "we" I mean not only the state, but the
3 state and the federal government and Alyeska together,
4 examined those alternatives and one alternative was
5 to utilize the work pad as a haul road. It is
6 our best judgment now that this would not have
7 worked very well. It would have been very difficult
8 to construct the pipeline and keep the construction
9 spreads out on the work pad and at the same time
10 use it for a haul road and roll 200 trucks a day
11 through the construction spreads, it would have
12 probably been an almost impossible logistic feat.

13 Q In speaking of the proposed
14 Fairbanks Corridor, is the gravel availability and
15 water availability sufficient on that route, to the
16 best of your knowledge, to avoid some of the problems
17 that you have indicated on the prime route and interior
18 route?

19 A The water availability --
20 which province do you want to address -- north of the
21 Brooks Range, the Koyukak Valley, The Tanana
22 Valley, or which? You have varying degrees in
23 each area, it is very difficult to generalize, but
24 I will take a try at it. The water and gravel
25 availability are as good or better on that route than
26 on any other route. The major source of water in
27 the Arctic Regions of Alaska of course is at Colville
28 River. This is one of the poor rivers, however, as
29 a gravel source, so for each route you have to evaluate
30 it on an individual basis and the present route was

1 chosen in large part because of gravel and water
2 availability and those factors still remain.

3 Q Well, it would be fair
4 to say then that the fact that you have the highway
5 and the oil line, has not in any way precluded
6 a third line because of the lack of gravel, for
7 instance?

8 A No, it has not.

9 Q I was interested in
10 your comments about the possibility of a chilled
11 gas pipeline being required to be above the ground.
12 Now, perhaps you could relate the experience with the
13 Alyeska hot oil line and how -- just if it is conceivable
14 that Arctic Gas would be required to put some of
15 their line above the ground in Alaska.

16 A The point I was trying
17 to make is that the State has not accepted in total
18 the concept that a chilled gas pipeline can be buried
19 in all soil conditions. The argument on the hot oil
20 pipeline is only a partial analogy, as most everyone
21 remembers, the original determination was to bury
22 by far the greater part of that pipeline. After
23 a couple of years of debate the stipulations were
24 written by a federal task force headed primarily by
25 personnel from the United States Geological Service,
26 that developed the present concepts we are using
27 as to which soils the hot oil pipeline could not
28 safely be buried in and which it could. The same
29 kind of analysis has not been done from the state's
30 perspective on the chilled gas pipeline.

1 All we are doing is reserving the right to examination
2 of this concept in the same thoroughness with which
3 the hot oil pipeline was gone into.

4 Q Dr. Weedon, you have
5 indicated that once road access is given to a certain
6 area, it creates a number of service demands and
7 maintenance demands. Has there been any experience
8 in Alaska with the so-called "front end" financing or
9 impact funding to provide communities and other
10 jurisdictions with the funding to meet the high
11 maintenance and service costs that are an added
12 burden on their revenue source?

13 WITNESS WEEDON:

14 A We do have considerable
15 experience and as you state, the very general
16 phenomenon we face is that there is a surge, an
17 upward surge of costs to public agencies at the
18 local and state and federal level initially during
19 the upswing end or portion of the major construction
20 projects such as the TransAlaska oil pipeline, and
21 that these costs fall upon the public, incidentally
22 citizens as well as the public agencies, long before
23 there are substantial revenues to offset.

24 So you do have a period of
25 outflow before you have the period of higher income.
26 If you were rich enough to have a large bank balance
27 this wouldn't worry you. Unfortunately, Alaska
28 did not have a large bank balance and what it had
29 evaporated during years of fairly rapid public
30 spending from 1970 through 1974, and thus we were

Parker, Weedon
Cross-exam by Veale

1 faced with an inability to meet all of the added
2 public costs. However, to the extent of our ability
3 to do so, we did provide monies ^{monies} to local communities
4 to help them face the burdens of adding to their
5 school systems, maintaining their streets in reasonable
6 repair, coping with all of the public costs in fact
7 which are very, very major in terms of increases
8 in police forces and research and statistical efforts,
9 planning of all sorts.

10 Maybe between Walt and I
11 we could come up with a rough estimate of the amount
12 expended by the state for that purpose in the last
13 year and a half, two years.

Weedon & Parker
Cross-Exam by Veale

And my recollection, Walt, subject to yours, is that the total outlay by the state has been about \$33 million in specific additional funding beyond any normal revenue-sharing by which the state passes money through to local communities. But above that normal revenue-sharing, approximately 30 to \$33 million has been advanced by the government, by the State Government, to allow local communities, Fairbanks, Anchorage, Glennallen, Copper Centre, and Valdez primarily, to cope with the problems of what we call pipeline impact.

Now the local communities, in addition, have had to raise their own taxes in order to try to cope with this, in part, at their own level. I cannot estimate how much incremental tax was added for that purpose in those communities. I would venture to say that if you added those local taxes to the state expenditures, pipeline impact expenditures, all you would have is a total of what the public was able to and decided to spend on that, not an estimate of the actual cost of increased services. I really wouldn't try to estimate what those actual costs were. The presumption is, of course, that when oil begins to flow out of that line and the State begins to get its share of the rent from that resource, that there will be a pay-back, and we certainly all hope that turns out to be the case.

Mr. Parker, can you add to that?

A Yes, Commissioner, we over the next five-year period estimated that going forward with our present program, which is largely maintaining and up-grading the present system, would cost some 450 million, and as a result of two years of Alyeska traffic, and not just the traffic from the pipeline company, but the extra traffic that the project generates, we estimate another 300 million will be required. In addition to that, for the state highway system to maintain itself at its present standards and meet the anticipated needs of the system, I want to emphasize that this involves no new major extensions of the highway system, but just up-grading the present system to meet the needs; and does not include any major expenses on the new road to the

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1 Arctic.

2 WITNESS WEEDON: I would like
3 to add a comment, Mr. Commissioner, if I may here.
4 We find-- found in the Alaska experience that insofar
5 as the money was available to be appropriated, the
6 legislature was not too reluctant to appropriate money
7 for local communities, to pass through to local communi-
8 ties for pipeline impact mitigation. But we found
9 that both the legislature and the Executive Branch
10 were unwilling in the early period, 1968, 1969, through
11 1973 or 4, and in fact even until now, they were
12 unwilling to recognize the added costs or added demands
13 placed upon the state agencies who were required to do
14 more research, to come up with the basic foundation of
15 knowledge that allowed us to grapple with the questions
16 of the Alyeska Pipeline. There were more demands for
17 the enforcement of Fish & Game regulations, for
18 example. More demands for the enforcement of state
19 laws that led to the need for more troopers in the
20 north and so on.

21 People recognized that those
22 demands were there but it wasn't, politically, a very
23 satisfactory thing to do to just simply put money in
24 significant amounts into those agencies to allow them
25 to do the job that they were being asked to do. So
26 the public agencies suffered in over-extending, stretch-
27 ing their existing resources very thin. I think
28 as a result since those public agencies had within
29 them a very large, perhaps the largest cadre of
30 professionally trained people capable of getting that

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Cross-Exam by Veale

1 information, yet they didn't have the budget to use
2 those people properly, then all of us suffered. The
3 inflow of information was simply not as rapid as it
4 should have been because of reluctance to appropriate
5 money to expand the travel and operational costs of
6 those departments.

7 MR. VEALE: Q Has there ever
8 been any consideration in Alaska for making such
9 additional costs prior to construction, and during
10 construction, a direct cost to the developer rather
11 than financing through public monies and awaiting the
12 revenue when oil flows?

13 A There was consideration
14 at one time of requiring the Trans-Alaska Pipeline
15 system, the predecessor of Alyeska, to build the
16 road without -- let me check on this, Walt, isn't
17 it correct that they were going to ask the oil
18 company to build that road even before the project
19 was actually authorized by the Department of the
20 Interior, and essentially build it on speculation?

21 WITNESS PARKER:

22 yes

23 There was some consideration of that, but the road
24 itself was of course built totally with Alyeska funds,
25 and will be turned over to the State when Alyeska is
26 finished with it.

27 I don't think they ever gave
28 serious consideration to building a road until they
29 had their approval for the pipeline right-of-way.

30 WITNESS WEEDON: To that

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Cross-Exam by Veale

1 extent certainly then Alyeska has provided some front
2 end money for a resource, the road, which will be
3 turned over to the public at the end of the pipeline
4 construction.

5 THE COMMISSIONER: Excuse me.
6 What would the extent of Alyeska's contribution to
7 the building of the road be? Do you have a figure, a
8 rough figure?

9 WITNESS PARKER: That figure
10 has not really been audited yet. The very roughest
11 figure I could come up with is probably \$250 million.
12 That's my figure, it's not Alyeska's.

13 Whatever the figure is, it
14 is added to the total cost of transporting the oil
15 southward and hence reduces the wellhead price of
16 oil, and hence the state shares in that cost since
17 the state -- the amount of money the state gets for
18 its royalty oil will be less. The taxes are based on
19 the wellhead price of the oil, and the higher the
20 transportation costs, the less the wellhead price.

21 Q so if the 250 million is
22 regarded as a cost like any other by Alyeska, then
23 the state revenues decrease.

24 A But the state does not
25 bear the total cost of that, of that road.

26 Q You say that when the
27 oil comes on-stream then the revenues will accrue to
28 Alaska and you will recoup, in some measure, the public
29 costs, 300 million for highways, 33 million by way of
30 this impact assistance to cities and towns on the route.

Weedon & Parker
Cross-Exam by Veale

1 I gather also that it was thought that the municipalities
2 or the boroughs might recoup some of the increased
3 taxation they've had to levy on their citizens to cope
4 with pipeline impact. Now all of that is in the cards,
5 is it? Is that a real expectation that you will get
6 all of that back?

7 Witness Weedon. A I haven't seen any
8 serious and thorough analysis of this recently, Mr.
9 Commissioner, but I'm sure it's still the expectation
10 of the people that this will occur over the life of
11 that project which might be 30 or 35 or 40 years, or
12 whatever it is. We do know, however, that the, initially
13 at least, the revenue will not come in at the rate at
14 which we expected:

15 (1) because there has been a decrease in the projected
16 from
16 throughput, 2 million barrels a day that was pro-
17 jected in approximately 1973, to 1.6 million barrels
18 a day;

19 (2) the cost of constructing the line and hence the
20 cost of transportation in total has risen astro-
21 nomically.

1 Third, the government itself
2 has, as bureaucracies tend to do, expanded to meet
3 or at least partially meet what they saw as demands
4 placed upon them and so that government spending
5 has increased very drastically. All of this means
6 that, at least in the first years, few years of
7 revenue from the pipeline, that there won't be
8 any large surplus for paving the streets with gold
9 or in fact meeting some more realistic needs of
10 schools and so on.

11 THE COMMISSIONER:

What about the schedule?

12 We understood the pipeline was to be completed in
13 1977, spring, and oil would start coming through in
14 the fall of '77. Is that still the expectation?

15 A Yes, Commissioner, it
16 is.

17 Q Is that on schedule, that
18 is, does that represent the original schedule after
19 approval was granted and all the court cases had
20 been gotten out of the way?

21 WITNESS PARKER:

22 A Alyeska's last report
23 was the pipeline itself was on schedule. The only
24 place where they had any particular worries at the
25 moment was in the Valdez terminal and they expected
26 to pick those up.

27 Q Is there a reason? There
28 must be a reason, what is it for the throughput being
29 only 1.6 million barrels a day instead of 2 million?

30 A That is just a re-evaluation

Parker, Weedon
Cross-exam by Veale

1 of the field and the reservoir and capacity and the
2 rate that it is desired to produce, the number of
3 development wells that will be in. They just made
4 a general readjustment of their output.

5 Q Well, oil won't
6 come onstream until the fall of '77, so it won't
7 be until '78 that the state will really begin to
8 obtain any revenue from this pipeline.

9 WITNESS WEEDON:

10 A Except that the pipeline
11 as a structure will be taxable by the local communities
12 at the time that it is laid and in place, but other
13 than those property taxes, you are correct.

14 May I also answer with
15 your question, pursuant to your question, that there
16 are some additional costs that the Alyeska Company
17 has agreed to pay. Its project has demanded the
18 full time surveillance of a number of state and
19 federal people, and it is my understanding that of
20 those people assigned to the TransAlaska oil pipeline,
21 for surveillance, their services are being reimbursed
22 by the Alyeska. I know in one of the state
23 departments this amounts to nine positions. There
24 are others in state government as well. Maybe, Walt
25 you have an idea how many people in total are being
26 reimbursed that way.

27 WITNESS PARKER:

28 A Well, the budget for
29 the state pipeline office of thirty odd people is
30 about 2 1/2 million and the Highway Department on

Parker, Weedon
Cross-Exam by Veale

1 reimbursible agreements with Alyeska is about a
2 million two, I think the other departments probably
3 come to about 300,000, so generally speaking about
4 4 million reimbursible to the state. The federal
5 government also is reimbursed by Alyeska for surveillance
6 to somewhere around 7 or 8 million dollars.

7 WITNESS WEEDON

8 A That is per year?

9 WITNESS PARKER:

10 A That is per year, yes.

11 So these were written into the lease agreements, these
12 particular ones.

13 THE COMMISSIONER: Well,
14 back to you, Mr. Veale.

15 MR. VEALE: Thank you,
16 Mr. Commissioner.

17 Q Commissioner Parker,
18 perhaps you could give us an example of the increased
19 maintenance costs with respect to the tremendous
20 use that a highway gets during construction. As I
21 understand it the Dempster Highway is being constructed
22 through the Yukon on a similar standard to that of the
23 Alyeska haul road, and perhaps you could give us an
24 example of the constant beating that a highway takes
25 from heavy equipment.

26 A Well, we felt that we
27 had a very good road north of the Yukon all in all.
28 It was built to the best gravel road standards that we
29 could at the time, with the caveat that you always
30 must use materials available in road construction in the

Parker, Weedon
Cross-Exam by Veale

1 Arctic within reason. If you get into material hauls
2 beyond ten miles, while your road building costs go
3 out of site. What we found was that when the project
4 was underway this summer, the traffic had to keep
5 moving even during periods of heavy rain. During
6 those periods of heavy rain, why the extensive
7 truck traffic in the neighbourhood of 200 trucks per
8 day fully loaded, plus the construction equipment and
9 light traffic of an unknown magnitude running along
10 the road, tended to seriously degrade the road.
11 In effect the constant traffic movement, plus the
12 action of the rain washed out all the fines in
13 the road surface and generally the surface was converted
14 to more of a cobble road very quickly. Well, this
15 is not an unsupportable thing, it just requires a
16 great deal of money to be expended on continuing main-
17 tenance to keep the road usable and we got into situations
18 at times where we had to maintain during the day
19 and put trucks over the road at night to keep
20 things moving, but no matter -- I guess the point I
21 am trying to make is no matter how good a job you
22 do on your initial efforts, you have to look at
23 rather expensive maintenance budgets to keep things
24 moving once these projects are underway. Because
25 when the project requires a life of its own and you
26 have 22,000 people out there working, they must be
27 supplied both in their own personal needs and the
28 needs of the line itself, and you just can't shut off
29 the traffic flow and wind it down to suit the vagaries
30 of the weather very easily.

These maintenance bills of course are either going to be picked up by the pipeline builder, or whatever, or by the government.

Q There has been a great deal of discussion about the impact of construction and equipment hauling on the migratory patterns of caribou herds. I was wondering if you could tell us exactly how the Alyeska haul road affects caribou migration in the State of Alaska at the present time.

A The Alyeska haul road pretty well bifurcates the eastern and western herds.. The Porcupine herd certainly moves across the haul road, but not as a general migration. It is more in the nature of the scattered western reaches of the herd in the same way the western Arctic herd undoubtedly crosses the haul road, but only with its scattered eastern bands. So far as I know there has been no encounter between pipeline construction and a major caribou migration. There has been a great deal of interaction between small bands of caribou filtering around the construction projects, and this of course has been going on at Prudhoe ever since 1968, and on the haul roads since it was built. The small bands have not presented any particular problem either to the project or to the caribou.

Parker, Weedon
Cross-exam by Veale

1 THE COMMISSIONER: Excuse me,
2 that is why, I take it, just reverting to yesterday's
3 discussion for a moment, forgive me, Mr. Veale,
4 that is why you do not regard the experience in the
5 vicinity of Prudhoe Bay as any indication as to the
6 impact that a pipeline crossing the main migratory
7 route of the Porcupine herd would have?
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Weedon & Parker
Cross-Exam by Veale

1 WITNESS PARKER: YES, BECAUSE BY
2 the time the Porcupine herd reaches the coast in its
3 summer migration, why it is pretty well broken up and
4 what you're seeing at Prudhoe is its far western reach.

5 THE COMMISSIONER: yes.

6 MR. VEALE: Q Is it fair to
7 say then if you took strictly the criteria of an
8 impact upon caribou, that what I would call, the
9 Fairbanks corridor, in the State of Alaska portion would
10 be less impact on the caribou than either the prime
11 or the interior routes?

12 A Yes, I think that would
13 represent our collective judgment at the moment.

14 WITNESS WEEDON: I would
15 certainly say so, and I've already described just now
16 the lay of the trans-Alaska oil pipeline north of
17 the Yukon. That portion of any gas pipeline that
18 would go along the Fairbanks route south of the Yukon
19 River would likewise skirt around and actually between the
20 ranges of more southerly herds in Alaska. The so-
21 called 40-mile herd occupies the Yukon-Tanana uplands
22 east of Fairbanks and largely west of Dawson, Yukon,
23 and rarely gets as far south as the Alaska Highway,
24 and then only scattered bands and in wintertime.

25 To the south of the Alaska
26 Highway, that is from the Tok-Northway area, the
27 herd, the small herd in Mentasta Pass of the
28 Alaska Range and the north side of the Wrangells that
29 herd is well south of the Alaska Highway by a matter
30 of 50 miles or more, and to my knowledge has not been

Weedon & Parker
Cross-Exam by Veale

1 recorded in recent times as getting up as far as
2 the flatlands of the Tanana River where the Alaska
3 Highway runs. So that if that route were followed by
4 a gas pipeline, at least within Alaska it would skirt
5 between caribou herds, rather than traversing the heartland
6 of the range of any of them.

7 THE COMMISSIONER: That is the
8 Fairbanks route?

9 A That is the Fairbanks
10 route.

11 Q We were told that there
12 was some controversy at our hearing in Whitehorse in
13 August as to whether the 40-mile herd had been diminished
14 in years past by impact with man, from man, by man.
15 What's your view on that?

16 A The so-called Steese
17 40-mile herd, and I can reference the doctorate
18 thesis of Ronald Skoog, which I think I may have
19 mentioned before, that's S-K-O-O-G, historically that
20 herd has been very large, probably several hundred
21 thousand after the turn of the century. Since the time
22 that biologists have been trying to make counts, however,
23 that herd in the 1950's and up to the middle 1960's
24 ranged between 30 to 50,000 animals, and seemed to be
25 reasonably stable at that time. In 1928 the Steese
26 Highway, that runs from Fairbanks to Circle City on
27 the Yukon, a distance of about 163 miles, was completed.
28 The Steese 40-mile caribou herd in its northward
29 migration every spring would cross that highway,
30 the cows would have their calves, and a few weeks

Weedon & Parker
Cross-Exam by Veale

1 later they would turn and come back crossing towards
2 the south again. This migration did not appear to
3 be affected by the use of the construction of that
4 road, the maintenance of it, or the use of it, right
5 through till the 1960's, the early 1960's, a period
6 of some 25 years, no, 35 years rather.

7 In 1962 and 1963, however,
8 for reasons we cannot explain, the Steese 40-mile herd
9 simply stopped going north of the Steese Highway.
10 They did not have their calves in the creeks north and
11 northwest of the highway, and I personally was there
12 over a period of four summers at the place where the
13 caribou typically crossed the highway. I observed
14 many instances where a few people in cars would stop
15 along the highway to take pictures of the caribou,
16 and in the process of taking pictures somehow people
17 with cameras think of themselves as supermen, and they
18 would chase the caribou trying to get closer, which was some-
19 what counter-productive, but the effect of this was
20 to cause the caribou herds to mill, frequently go
21 back in the direction they came, and it might have
22 been a matter of an hour or a day before the caribou
23 then continued on their migration, frequently at night
24 when the traffic was less.

25 However, I cannot say that
26 this effect of the traffic or the photographers or
27 anything was the cause of this sudden shift in the
28 range of that caribou herd. In 1963 was the last of
29 the migrations across the Steese Highway, and we have
30 not seen them come back since. We lost track of the

Weedon & Parker
CrossExam by Veale

1 herd in the sense' that we were unable to tell exactly
2 where they were having their calves and we could not
3 get good counts on them. We were assuming throughout
4 the 1960's that there were still some 30 or 40,000
5 caribou in that herd, until about 1969 or 1970 when
6 there seemed to be a possibility that a fair number
7 of animals in that herd might have gone northward and
8 joined the Porcupine caribou herd. No one knows for
9 sure if that happened. All we know is that about 1972
10 we suddenly realized that we found out where the
11 caribou were having their calves, and we discovered
12 that there were only somewhere between five and 10,000
13 caribou remaining.

14 The season in 1973 and subse-
15 quently the hunting season has been cut way back, the
16 bag limit has been reduced. We have not seen any effect,
17 as yet, on an increase in the caribou herd, and part of
18 the reason may be that the wolves are at fairly high
19 numbers, and certainly the mortality of caribou calves
20 is very high. But the net result of all this is that yes,
21 there is a Steese 40-mile caribou herd, it's alive and
22 well but very small. It's probably on the order of
23 5,000 animals.

24 In terms of planning for the
25 future, however, I think we can assume that over the
26 30-year life of a pipeline project, for example, during
27 that period of time the caribou are very likely to
28 increase back to something like their former numbers
29 of 30, 40, or 50,000, and probably occupy pretty much
30 the entire range that they have historically occupied

Weedon & Parker
Cross-Exam by Veale

1 all throughout this century.

2 As I say, for anyone planning
3 a major project, you wouldn't plan for the small size
4 and small area of the herd now, you would plan for
5 what has historically been the case in the past decades.

6 Q You mean if you were
7 planning a development in the region of the 40-mile
8 herd?

9 A That's correct.

10 Q Yes, Mr. Parker?

11 WITNESS PARKER: Yes, Mr.
12 Commissioner, you know the effects of wildfire and
13 warble fly infestation, of course, always have some
14 effect upon the herds, and these effects come and go,
15 so as Mr. Weedon says, if you leave sufficient habitat
16 for your herd to inhabit again at its former levels,
17 it may increase to those former levels. Certainly if
18 you reduce habitat, you have to expect ultimate popu-
19 lation densities to decline also.

20 THE COMMISSIONER: Well, maybe
21 we should stop for coffee.

22 MR. VEALE: That would be
23 appropriate. I have one follow-up question and I'll be
24 concluded.

25 Your last question was the
26 area that I was interested in.

27 Q When you talk of, Dr.
28 Weedon, as I understand your last comments, you were
29 talking about preparing the way for a herd to diminish
30 and then increase in size, and is there a state of

Weedon & Parker
Cross-Exam by Veale

1 knowledge which demonstrates how this can be done, No.
2 1, and No. 2, can it be done if you have a traffic flow
3 *on the Steese* Highway? In other words, once you
4 as on the Steese Highway? In other words, once you
5 put your highway in, it has a life of its own and
6 constant traffic, are you ever able to build back up,
7 in other words will the 40-mile herd ever be able to
8 be built back up?

9 WITNESS WEEDON: I guess again
10 it would be simply a matter of judgment rather than
11 imperical knowledge. I don't know whether it would be
12 possible. My feeling is, though, that if the Steese
13 40-mile caribou herd were to build up because hunting
14 pressure was reduced for a period of time, and so on,
15 it's highly likely that in this period of population
16 expansion, they would begin using more and more of their
17 total historic range, and in fact they might very well
18 begin to move their calving grounds to the northward
19 again. Now if that were to occur, despite the fact
20 that the Steese Highway is there, if there were suffi-
21 cient questions, sufficient likelihood that traffic
22 on the Steese Highway would be a barrier to the north-
23 ward extension of the caribou herd, I think it would
24 be possible to simply manage the traffic on that
25 road so that during the period of migration you would
26 shut off all but essentially emergency traffic.
27 You could do this by only affecting the area in this
28 particular case from Mile 100 beyond, rather than the
29 entire length of the Steese Highway, because it's at
30 Miles 100 to 110 that the caribou cross. So I think
that there are things that could be done if the possi-
bility of affecting the caribou herd by the traffic

1 were sufficiently great. Q As you say, there is
2 no empirical evidence of this ever having been
3 done and would it be fair to say that considering
4 all the associated developments that follow a large
5 scale development of the one that we are speaking of,
6 it would seem to me that it would be more likely that
7 the traditional large areas that the caribou freely
8 migrated on, may in fact be diminished as a matter
9 of fact?

10 A Well, I think that that
11 is correct. My view is that if the extraction of
12 non-renewable resources continues at the present pace
13 and in fact expands as many people think it will
14 or desire it too, the range for all of these wide-
15 ranging, essentially wild country species like the
16 caribou, will cut up further and further.

17 We don't know what effect
18 this will have on all of the caribou or other
19 species, nor how rapidly it will occur, but we can't
20 believe that it will be good for them. There is
21 nothing to suggest in the past that a man's occupancy
22 of a country of caribou has helped the caribou any.

23 MR. VEALE: Those are my
24 questions, Mr. Commissioner.

25 THE COMMISSIONER: One
26 just final thing before we adjourn for a minute.
27 When the Alaska pipeline was first supposed to get
28 underway, was that in 1969?

29 A Yes, the announcement
30 of the discoveries of oil in Prudhoe Bay were made in

1 July or August of 1968, I believe and it was by
2 early next spring, or spring of 1969, the TransAlaska
3 Pipeline Company had been formed and was making
4 informal application to the Department of the Interior
5 for the right-of-way.

6 Q Well, what was the
7 projected cost of the project, then?

8 A At that point it was
9 slightly under \$1 billion.

10 WITNESS PARKER:

11 A I think it is important
12 to point out, however, that that 900 million
13 figure was based upon total burial throughout its
14 length and not a very good cost projection even on
15 that. Before the decision was made to go above
16 ground for substantial portions, the pipeline had
17 risen to 1.5 billion by the summer of 1970 --

18 Q That was before you
19 decided to go above ground?

20 A Before decided to
21 go above ground. When the decision was made to go
22 above ground, the next estimate that was heard was
23 3.5 billion which gives you some idea of what the
24 costs of going above ground were. Then the costs
25 of the Valdez terminal were seriously underestimated
26 because of course the terminal itself is now costing out at
27 something over a billion dollars. It wasn't a
28 very good estimate to begin with.

29 WITNESS WEEDON:

30 A And on top of that then,

Weedon, Parker

1 the recent upward changes of the estimates have been
2 largely a result both of national inflation, local
3 inflation and the rapidity, the speed of the project, it
4 is a crash program and hence more costly.

5 Q And what is the figure
6 that is currently given as the projected cost of the
7 project?

8 WITNESS PARKER:

9 A 6.3 billion.

10 Q The pipe I understand
11 was purchased five or six years ago.

12 WITNESS WEEDON:

13 A In 1969, I believe, sir.

14 Q Yes, well, that would repre-
15 sent a saving, would it, in that the effect of inflation
16 was avoided, one makes a deduction for storage costs
17 or whatever. What was the total cost of the pipe,
18 do you remember?

19 WITNESS PARKER:

20 A 400 million, a little
21 bit in excess of that if my memory serves me.

22 WITNESS WEEDON:

23 A I don't believe that
24 they lost significant value of the pipe due to deteriora-
25 tion in that time. I think that they treated it
26 well and coated it, for example and I think that
27 you are correct, the only costs are essentially the
28 storage and the investment, or the interest on that
29 investment.
30

Weedon, Parker

WITNESS PARKER:

A The cost of treatment probably exceeded the original cost of the pipe eventually.

Q Do you know what the pipe would cost now?

A No idea.

Q What was the reason for going from buried mode to elevated mode? Was it the discovery of the true nature of the ground that they were going to travel through or what?

A Yes. The general nature of the ground was known then. It was simply that the pipeline company could never demonstrate a satisfactory method of burial, no matter how they approached it. It became obvious, as time went on, that they would not be able to insulate the pipe sufficiently to prevent the soils, the permafrost soils from deteriorating and wasting in a rather massive manner and they didn't really, you know, they admitted finally that there wasn't really any other engineering choice than to get above ground in thaw unstable soils. The original decisions were made by people without extensive Arctic experience. As the people involved in Alyeska Pipeline acquired Arctic experience, why their engineering parameters rapidly reduced themselves. They would have had to arrive at the same conclusions themselves without any help from the geological survey. It would just have probably/been a great deal more expensive if they

Parker, Weedon

1 had done it by trial and error.

2 THE COMMISSIONER: Well,
3 thank you very much. Well, we will stop for a
4 few minutes for coffee.

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6 (PROCEEDINGS ADJOURNED)
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Weedon & Parker
Cross-Exam by Bell

1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 THE COMMISSIONER: Well, let's
3 come to order again. Mr. Bell?

4
5 CROSS-EXAMINATION BY MR. BELL:

6 Q Yes, Mr. Parker, are
7 you ~~die~~ to comment on the settlement of native land
8 claims in Alaska as related to the construction of the
9 Trans-Alaska Pipeline?

10 WITNESS PARKER: I can make
11 some general comments. I've been associated with
12 both on a reasonably continuing basis for the past
13 several years.

14 Q You say you have some
15 connections with this issue. Could you tell us about
16 that?

17 A Yes, the native claims
18 settlement was, the original position for Senator
19 Jackson's Committee was developed by the Federal Field
20 Committee for Development Planning in Alaska, and that
21 development took place in 1968. I went to work for
22 the Field Committee in 1970-71, at which time we were
23 still involved with the claims settlements. That's
24 when I came on-board, so I can only testify as to the
25 earlier developments through conversations and in
26 effect literature review and hearsay of conversations
27 with the staff members who were still on-board when
28 I came there, but I guess my background is as good as
29 most in that particular area.

30 Q Could you tell us then

Weedon & Parker
Cross-Exam by Bell

1 the background and development of native claims, as
2 you know it in Alaska?

3 A Sure. The native
4 claims in its movement in Alaska, of course, goes
5 back to the establishment of the Alaska Native
6 Brotherhood around the turn of the century, but it
7 received its recent impetus in the past decades from
8 probably you can trace it to two major events: The
9 decision by the Atomic Energy Commission to use
10 Cape Thompson as a test site engendered a reaction
11 from the Inupiat peoples living in that area, primarily
12 the Village of Point Hope.

13 THE COMMISSIONER: Excuse me,
14 where is that in Alaska?

15 A In the far north-western
16 corner.

17 Q I see.

18 A And this, in effect,
19 triggered the development of political movements under
20 -- in the Inupiat peoples and started a ripple effect
21 there, and the Rampart Dam controversy in the interior
22 brought about the development of what was called the
23 3 G's movement, which I can't remember the Athapascan
24 words for it, but anyway, the "Protectors of the Land"
25 was the translation, and this was an Athapascan group
26 centred ^{ON} on Fort Yukon, who began to take steps
27 to protect their rights and land. This was in the
28 period of the Rampart Dam controversy in the early
29 '60's.

30 The movement spread outward

Weedon & Parker
Cross-Exam by Bell

1 and by 1966 there were beginning to be groups all over
2 Alaska forming to protect their rights in land. These
3 eventually came together in the Alaska Federation of
4 Natives, which still exists, and is the coalition of all
5 But all two of the regional native corporations that
6 exist now.

7 In 1966 Secretary Udall insti-
8 tuted the first land freeze in Alaska and this in
9 effect stopped the transfer of federal lands into
10 either private or state hands, until the land claims
11 settlement was resolved.

12 In 1968 Senator Jackson asked
13 the Federal Field Committee to develop a position on
14 native land claims from which he could take forward
15 and use as a base for legislation.

16 In the fall of 1960 -- well,
17 it was really in the spring of 1969, the Field Committee
18 gave him their final report which was published as

19 "Alaska Natives and the Land."

20 Using that report as a basis, why Senator Jackson went
21 forward, and over the next several years in his
22 Committee developed the Alaska Native Claim Settlement
23 Act. By that time, of course, the native movement in
24 Alaska had increased dramatically and there were
25 some 12 regional groups.
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A Well, the Claims Settlement created a joint Federal State Land Use Planning Commission which was formed in 1972 and the implementation of the Claims Settlement began, and of course is going forward at this time. Congress instituted several right tight deadlines which had to be met by the Native corporations in their selections of land. What was created in the Claims Settlement was twelve Native corporations and an unspecified number, these regional corporations and an unspecified number of village corporations which were based generally on a list of 178 villages which were included in the, -- that list was included as part

1 of the Act, but was subject to further development
2 by peoples coming forward and establishing their rights
3 to a village. As of this moment the corporations
4 do exist, some of the village corporations are not
5 completely finalized yet, but they are all in existence in one
6 form or another, are involved actively in the process
7 of refining their land selections, some have made
8 their land selections and the process is well under
9 way.

10 MR. BELL:

11 Q You mentioned the fact
12 that the Secretary of the Interior instituted² a
13 land freeze in 1966, I believe you said.

14 A Yes.

15 Q Could you give us some
16 more details about that?

17 A Yes, well, the land
18 freeze was further amplified in 1968. Of course
19 one of the problems that arose in the securing of
20 a right-of-way for the pipeline was the fact that
21 transfer of land was frozen. The Secretary withdrew
22 the two pipeline corridors which we have had previous
23 reference to here. The one from Prudhoe Bay to Valdez
24 on federal lands and the ones south of the Arctic
25 Wildlife Range on federal lands and that is---

26 -- yes, it was somewhere, March or April
27 '69, that he made those withdrawals. Those particular
28 withdrawals still exist and as we said in the previous
29 testimony, their primary reason is to ensure that neither
30 Native selections or state selections will impede

Parker, Weedon
Cross-Exam by Bell

1 the institution of any unnecessary transportation
2 improvements in those corridors, transportation
3 improvements which are considered necessary for the
4 national welfare.

5 WITNESS WEEDON:

6 A Could I interject a
7 little bit of clarification? The specific action in
8 1966 by the Secretary of the Interior, Stewart Udall,
9 was to prevent remaining federal lands from being
10 selected by the State of Alaska as part of its
11 statehood patrimony of 103 1/2 million acres, so
12 that state lands selections would not jeopardize
13 any future settlement of Native claims.

14 In 1968 he extended that action

15 THE COMMISSIONER: Excuse me,
16 would you repeat that? I just want to make sure that
17 I have got it, I am sorry.

18 A The Secretary said
19 that from 1966 on, the State of Alaska could not
20 select lands from the federal lands as it had the
21 right to do under the Statehood Act.

22 THE COMMISSIONER: Excuse me,
23 before Statehood, all of that land was federal?

24 A Correct.

25 Q After statehood, it
26 wasn't turned over en block so to speak, the
27 matter was still in suspense when the Secretary ordered
28 the freeze, is that what happened?

29 A Yes, the Statehood
30 Act said that among other things, the state would

Parker, Weedon
Cross-Exam by Bell

1 obtain from the federal government over the years
2 was up to approximately 104 million acres of land which
3 the state could select over the 25 year period
4 from statehood until 1984.

5 However, the process of
6 selecting that land, as you can imagine was a long
7 and careful one. It was brought to a halt in 1966
8 by the Secretary's determination that any further
9 selection of land by the State could jeopardize
10 the rightful claims of the Natives.
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After the Claims Settlement Act was satisfactorily resolved by the Congress, the, which of course would supposedly have opened up the way for rapid granting of a lease across federal lands, for the pipeline, however by that time, there were suits brought against the pipeline, both against the Department of the Interior and the Alyeska Corporation, well actually its corporate members, it's a consortium and it's not a very good one to sue, so it was against the corporate members of the consortium, enjoining their right to either grant the permit or to use it if they got one. The suit was brought by Friends of the Earth, the Environmental Defence Fund, and the Wilderness Society.

There were also various suits brought by village native groups and by regional groups against the granting of the pipeline right-of-way. All these together were what delayed the granting of the right-of-way until congressional action was taken in December of 1973, wasn't it, ordering the Department of Interior to grant the lease and the permit for the right-of-way, and also declaring that the National Environmental Protection Act had been satisfied by the existing environmental impact statement on the pipeline, which in effect of course removed the oil pipeline from further consideration under the National Environmental Protection Act.

And a land settlement.

A As far as mobilization
of men and equipment for them?

A Yeah, they're forced by
their nature to make maximum use of whatever is
available to them. That enormous amounts of equipment
and man power that have to be gotten in place, so I

Weedon & Parker
Cross-Exam by Bell

1 think any company is going to do the same as Alyeska
2 did, they're going to go out and get the best traffic
3 people you can find and they've got some very good ones,
4 and get your equipment on place by whatever means is
5 available to you. For Alyeska that meant barges and
6 Hercules air lift, in the early years, and now that
7 they have the highway why, of course, the traffic has
8 shifted to the highway except for those very massive
9 modules which can't be trucked and which can only be
10 gotten in place by barge.

11 Q I would like to refer to
12 a specific aspect of the Mackenzie Valley Pipeline
13 as it's proposed and ask you whether it falls within
14 the ambit of your answer; are you familiar with the
15 location of Fort Simpson?

16 A Just generally. I've
17 flown over it, I've never been on the ground.

18 Q And do you know where
19 Fort Nelson is?

20 A Yeah, I've been to
21 Fort Nelson many times.

22 Q Well, we're told by
23 the applicants, as I understand it, that Fort Simpson
24 is going to be a regional headquarters, both during
25 and after construction of the pipeline, and that it
26 may become a storage depot and loading point for the
27 barge system on the Mackenzie. There is a clearing
28 for winter road which connects Fort Simpson to Fort
29 Nelson, and Fort Nelson is then ^{is then} connected to the
30 British Columbia highway system. I would like to ask

Weedon & Parker
Cross-Exam by Bell

1 you whether, in your opinion, that clearing for winter road
2 would become a winter road and would be used as such
3 the should construction of the pipeline go ahead?

4 MR. MARSHALL: Well, sir, I
5 hesitate to interject in my friend's cross-examination
6 but I appreciate that there are great latitudes in the
7 evidence of the Inquiry, but isn't this breaking new
8 ground? We're getting into just pure speculation.

9 THE COMMISSIONER: Well, it's
10 purely a hypothetical matter, but Commissioner Parker
11 is the Commissioner of Highways, he gave evidence in
12 Whitehorse about corridors and history of highway
13 development and other transportation in Alaska. I
14 think he's about the only person who's appeared here
15 I would allow to attempt an answer, if he wishes to.

16 MR. BELL: He's the only one
17 that I would ask, sir.

18 WITNESS PARKER: I think,
19 would you re-state it as to exactly what you want to
20 know about the relationship of the winter roads to the
21 project, whether it's possible to mobilize equipment
22 and that kind of thing?

23 Q No, I'd just like your
24 assessment of the probability, whether that winter
25 road, whether that clearing will be used to transport
26 material along a road, should the pipeline go ahead?

27 A Well, there is the problem
28 with winter roads is how long you can use them and
29 without knowing anything at all about that particular
30 route, why when you can use it is going to be dependent

Weedon & Parker
Cross-Exam by Bell

1 upon your river crossings and your lake crossings and
2 how soon you get ice thick enough to move equipment
3 of the weight you want to move.
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Parker, Weedon
Cross-Exam by Bell

1 Normally, that gets you into
2 January in Alaska and you can safely move things
3 until about the first of April. As to whether the
4 winter road can then be utilized later, no, you
5 can't -- obviously aren't going to be able to ever
6 use it as anything other than a winter road until
7 you build a real road. I don't know enough about
8 Canadian law to know what use, you know, as a
9 winter does about right-of-way. I can't comment on
10 that at all.

11 Q But within those
12 constraints it can only be used in certain months?

13 A You can only use it
14 when the ice is thick enough to bear the weight
15 of the equipment that you want to move.

16 Q Would you then say
17 that there is a fairly good probability that it would
18 be used? There is a fairly good probability or
19 possibility?

20 Q Oh, sure, I don't see
21 why not. The problem with the winter road in Alaska
22 that the so called Fickle Highway which we spoke
23 about earlier was simply we couldn't move the amount
24 of freight over it that was desired because by the
25 time that the road was built, the season had just
26 about run out, they moved freight over it for about
27 six weeks, but nowhere near the quantities that were
28 envisioned and that was one of the reasons they
29 never went back to it as a means of moving freight.
30

MR. BELL: Those are all the

1 questions I have..

2 THE COMMISSIONER: I read
3 a book about the Alaska land claims settlement and
4 its relationship to the pipeline. The author, I think,
5 was a woman named Ross.

6 A Mm-hm.

7 Q Do you commend that
8 book or not?

9 A I haven't read it,
10 Commissioner. I believe she wrote it from the
11 Washington perspective, if I remember the author
12 correctly, why she was on the scene in Washington
13 pretty much through the period of the claims settlement,
14 so I would assume she was in a position to know her
15 facts from that perspective, pretty well.

16 THE COMMISSIONER: Okay,
17 well, Mr. Bayly?

18 MR. BAYLY:

19 This isn't a signal that
20 it will be the wrong time for convenience.

21 THE COMMISSIONER: Right,
22 well you don't usually give us signals, so --

23 CROSS-EXAMINATION BY MR. BAYLY:

24 Q Gentlemen, if I can
25 address my first question, I believe to Commissioner
26 Parker. It is concerning evidence that was brought out
27 on cross-examination by Mr. Marshall concerning
28 spills of petroleum products. If I can refer you
29 to the transcript at page 7482, commencing at line
30 22, volume 54, you stated in that that you were concerned

Parker, Weedon
Cross-Exam by Bayly

1 with petroleum products potential effects on the
2 frost bulb and that these petroleum products would be
3 those that might spill and I am assuming that that
4 was during the time of construction, is that
5 fair to say? It reads:

6 "Petroleum products entering the sub --"

7 A Yes, I have got it here.
8 I am getting a reference to the rest of the testimony.
9 Yes, I think we are referring to the construction
10 phase there.

11 Q Now, Mr. Marshall
12 cross-examined you on the basis that his information
13 was that certain, or most petroleum products did
14 not combine with water to change the freezing point
15 of the water and my question to you is whether you
16 were referring to methanol used in testing or
17 anti-freeze as some of the petroleum products that
18 might be spilled during construction.

19 A Well, I think that that
20 is Dr. Weedon's testimony there, but I will --

21 Q I am sorry, if Dr.
22 Weedon would prefer to answer, I have no objection.

23 A I have got no problem
24 with answering it. There is the two problem's
25 brought up, water quality, and of course, we always
26 try to avoid oil and water to the maximum extent.

27 Regarding the petroleum
28 products entering the subsurface drainage system, and
29 lowering the freezing temperatures of the groundwater,
30 this is getting into the integrity of the buried gas

Parker, Weedon
Cross-Exam by Bayly

1 pipeline and comes from the B.L.M. Environmental
2 Impact Statement. I would have no comment on that
3 at the moment. We need to get into that in much
4 more depth.

5 Q Would you agree with
6 that, Dr. Weedon?

7 WITNESS WEEDON: A Yes.

8 Q Now, that leads me to
9 the question, in the Alyeska Pipeline, whether or
10 not the company or the contractors were required to
11 supply eitherto the federal or state governments a list
12 of the substances that they were using either in
13 construction or in operation or planned to use in
14 operations and maintenance of the line?

15 WITNESS PARKER:

16 A Oh, yes, that was part
17 of the stipulations and normally substances were a
18 part of the notice to proceed, whether those be --
19 well, a good deal of this, of course, is covered by
20 the state's permitting process. They couldn't to out
21 and just spray anything they wanted for insect
22 control. They had to have a permit to do that, and
23 as far as the substances that would be used in any
24 of the testing such as hydrostatic tests and so forth,
25 yes, those are going to be very closely controlled.

26 Q Now, when they would
27 apply, did they give you just the substance they
28 wanted to use or did they give you lists of alternative
29 substances that could be used and leave the state
30

Parker, Weedon
Cross-Exam by Bayly

1 to decide which one would be put in the permit?
2 The reason I say that is I understand, for example,
3 that there are two kinds of anti-freeze, one which
4 is toxic and another which is not, and that would
5 be an example of the thing that I mean.

6 A Some of both. Normally
7 they would specify what they wanted to use and if
8 it was on a list of permitted substances, why they
9 could go ahead. If in some cases, as in the insect
10 control, there were several which were offered and
11 sometimes different substances would be used at
12 different sites, but normally this was handled
13 under the state's pollution control statutes, or
14 there would be a list of permissible substances
15 and if Alyeska's were on that list, why they would
16 get the go ahead.

17 Q All right, and if they
18 weren't then they would have to demonstrate that they
19 acceptable.

20 A Right.

21 Q I understand.

22 Would you recommend as a
23 result of the experience that you had with the
24 Alyeska line that applicant's provide alternate
25 substances that can be used so that authorities
26 granting permits will have some sort of choice in
27 determining the impacts of the various substances?
28
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Weedon & Parker
Cross-Exam by Bayly

1 WITNESS PARKER: I think that
2 would be prudent on their part. It would probably speed
3 up their permitting process unless they were absolutely
4 certain that the substance was going to be permittable,
5 why options always speed up the flow.

6 Q Yes. I understand that the
7 proposal to build the Alyeska line was to utilize
8 winter construction procedures throughout, and my
9 information is that recently that -- there has been a
10 fundamental change in that.

11 A I think you may have
12 misinterpreted something there originally. There
13 was a winter and summer construction schedule, and some
14 of that has been modified. The last report out of
15 Alyeska was that they were going to reduce their
16 work force from 22,000 to 6,000, effective at a date
17 in December, which I don't remember, and the original
18 schedule was to continue construction through the
19 winter months. They of course will do some construction
20 with the 6,000 remaining work force but probably not at the
21 level they originally contemplated. However, Alyeska
22 is treating this as just part of their normal schedule
23 and they didn't announce it was as a result in any
24 delay or anything, they were just going to generally
25 reduce their level of operations in the winter.

26 Q Is this a reduction over
27 the winter numbers of construction workers that they
28 had employed last winter, for example?

29 A Last winter they did
30 not announce this early, they did, however, shut down

Weedon & Parker
Cross-Exam by Bayly

1 over part of the winter, but it was not scheduled
2 in quite the same manner as this one. It was somewhat
3 more informal.

4 Q Did this come then as
5 a surprise, that they had made this decision, say,
6 to your office?

7 A It was somewhat of a
8 surprise, but not unexpected. The problems of
9 pipeline construction in deep winter were something
10 that -- major pipeline construction in deep winter
11 were something that neither of us had that much exper-
12 ience with, so it was kind of a proving period.

13 Q I take it then that it
14 proved to be less successful than at least Alyeska
15 could have wished for.

16 A Yes, they had very real
17 system problems with construction in extremely cold
18 weather, mainly in the meeting the welding qualifications
19 and just the general operation of the equipment, of
20 course, until you have tried to ^{would you have time to} operate equipment at
21 50 below ^{why} why- you don't appreciate the problems.

22 Q Now with regard to the
23 weld, was there -- were there quality problems that
24 resulted from a certain temperature, or was it a
25 question of not being able to weld properly under
26 artificial light? Could you perhaps expand on that?

27 A No, it was just a problem
28 of keeping the pipe warm enough to keep it within the
29 welding qualification standards that were established.
30

Weedon & Parker
Cross-Exam by Bayly

1 Q What was the atmospheric
2 temperature, approximately, at which point welding
3 quality could not be maintained?

4 A I think probably between
5 10 and 20 below.

6 Q And that would therefore
7 cut out a large portion of your winter in the northern
8 parts of the pipeline.

9 A Right. However, I would
10 like to qualify that. That was the situation the last
11 time I encountered it, which was some months ago, and
12 Alyeska may have taken steps to get around this parti-
13 cular problem by now. They have not announced that the
14 inability to meet the welding standards as their reason
15 for the shutdown, at least they haven't, for the partial
16 shutdown. At least they haven't announced that
17 publicly.

18 Q Commissioner Parker,
19 you referred to systems problems, and what apart from
20 equipment being very difficult to operate at very
21 severe temperatures, were there any others that
22 you would wish to refer to?

23 A No, the welding is your
24 primary problem. If you can't weld, you can't lay pipe.

25 Q So that was the main
26 system that just didn't work.

27 A Right.

28 Q Has the state considered
29 what will happen on December 10th to the 16,000 workers
30 that will suddenly be without jobs?

Weedon & Parker

Cross-Exam by Bayly

A Yes, we've thought about

Q Yes. There are problems,

A Yes, housing is very

WITNESS WEEDON: I might point

Q So you're faced with

Weedon & Parker
Cross-Exam by Bayly

1 that until those people can get another job, either in
2 the State of Alaska or somewhere else?

3 A Yes.

4 Q And then how is this term
5 "Alaskan" defined, Commissioner Parker, that you
6 referred to? How does Alyeska decide which people to
7 keep on? Is it the period of months of residence that
8 would define that for them, or --

9 WITNESS PARKER: It's defined
10 when they first come on the job as to whether they're
11 Alaskan residents or not, and the lists are maintained
12 on that manner, and the Department of Labor is the
13 state agency which works with Alyeska in making that
14 particular determination. Generally all you have to
15 do, of course, is make the same residency requirements
16 that are general throughout the United States. You
17 have to show some evidence that you in fact reside
18 in Alaska, and do not maintain your permanent
19 residence elsewhere.

20 Q I see, so the criteria
21 are based on employee making a statement that he has
22 a permanent home in Alaska. Am I correct in assuming
23 that investigations don't generally go beyond that?

24 A Oh no, I think labor
25 to the extent of its resources tries to make sure that
26 these statements are verifiable.

27 Q All right, now this
28 decision on the part of Alyeska to hold onto Alaskan
29 residents as long as possible on the job, is that
30 something that they have decided on their own, or

Weedon & Parker
Cross-Exam by Bayly

1 was that decided either by the state or in co-operation
2 with the state?

3 A In co-operation with the
4 state. It's been our position for a long time that
5 the very massive unemployment situation in Alaska
6 should be mitigated by the Alyeska project to the
7 maximum extent possible.

8 THE COMMISSIONER: How many
9 Alaskans would be among the 22,000, I take it the 22,000 is
10 a peak figure?

11 A That figure has been
12 subject to a great deal of debate. Alyeska uses one
13 figure, the Department of Labour uses another, and
14 I think 8,000 is the highest figure that I've heard
15 thus far. But some people say it's only four.

16 Q I see. So it's somewhere
17 between four and eight?

18 A I would say so, yes.

19 Q Just pausing here for
20 a moment, Mr. Bayly, the native people of Alaska
21 constitute something like 20 to 25% of the population,
22 do they?
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Parker, Weedon

Cross-Exam by Bayly

A About 20%, probably

THE COMMISSIONER: Under

A Yes, the records are

I should expand on that.

Q Are you saying that

A Well, I am saying that

1 have been signed for Natives to prefer to work for
2 their own corporations rather than to go into one of
3 the other unions. It is a problem of getting which,
4 you know. even if you are working for the corporation
5 you don't get around to the problem of union member-
6 ship completely, and it is always the --- the
7 Alyeska situation hasn't changed our historic
8 problem which is upward mobility from the village
9 to get into the union into the job. We have always
10 had that problem and --

11 Q You have always had
12 that problem as far as Native employment is concerned?

13 A Sure.

14 Q And you still how got it

15 A Yes, to a lesser degree,
16 however. Communications, improved communications
17 is one of the major factors. The inability
18 of the Native to remain in town for several weeks
19 and work his way through the hiring hall, and the
20 inability of the union to contact him when he was
21 back in the village has always been a problem, and
22 now as we get more telephone service into the villages,
23 why people can wait at home and still hop the next
24 plane into town and make a job call.

25 Q The Native people of
26 Alaska, I understand, and I trust you will tell me
27 if I am wrong, do not live on the route of this
28 pipeline except for a small percentage of them. Is
29 that right or wrong?

30 A North of the Yukon there

Parker, Weedon
Cross-Exam by Bayly

1 is only one native village, Stevens Village that
2 is at all close to the pipeline route. The rest
3 of them are anywhere from 30 to 50 air miles removed
4 from it. South of the Yukon there is a large
5 concentration of urban natives in Fairbanks and then
6 the villages of the Ahtna region are generally
7 concentrated along the pipeline corridor and also
8 most of the people in the Chugach region could be
9 said, to -- a good part of them could be said to
10 be directly influenced by the pipeline corridor.

11 Q But it would have
12 virtually no impact on the lands occupied by Eskimo
13 or Aleut people, would that be true?

14 A It would have a very
15 minimal impact. The major impact in that regard
16 would be right on the North Slope where a pipeline
17 traverses the North Slope Borough and is going to
18 have some influence on the way in which the North
19 Slope Native Corporation develops their rather
20 extensive holdings, but it doesn't traverse those
21 lands directly, no.

22 Q The North Slope Native
23 Corporation would be centered in Barrow --

24 A Right, the Village of
25 Nuksut which is the nearest Eskimo village to the
26 pipeline on the North Slope, is about 50 miles away
27 from Prudhoe.

28 THE COMMISSIONER: Well, carry,
29 on, Mr. Bayly.
30

Parker, Weedon
Cross-Exam by Bayly

MR. BAYLY:

Q Commissioner Parker, with regard to this question of hiring, were there any stipulations in the permit granted to Alyeska that made special considerations required for Native peoples being hired on. Now, you mentioned the hiring halls' problems and there don't appear to have been any exceptions there. Were union closed shop rules relaxed in any way in order to permit native peoples in Alaska to participate in the project?

A In regard to the first part of your question, no, the lease and its stipulations referred strictly to environmental concerns. In regard to the second, yes. Yes, the unions made a serious effort to do better on Native hire and to get as many Native people as they could out on the pipeline. You know, they had to meet the needs of all their other members too, but there was a good faith effort on the part of the labour movement in Alaska to maximize Native hire.

Q So the fact that many Native peoples prefer to work for the subcontractor who is, or which is a native corporation is a question of preference rather than a question of that being the only option open to them if they do want to work on the pipeline.

A Yes, it is strictly a question of preference and the people running the corporation, of course, being friends and colleagues, it

Parker, Weedon
Cross-exam by Bayly

1 is simply easier to go to work for them.

2 Q Yes. Now, with regard to
3 arrangements that were made between Alyeska and the
4 government of the state or the federal government,
5 were there any stipulations at any time in the
6 construction that workers were to be removed from
7 Alaska either when the job had been completed or
8 when they would be allowed to rest and relax?

9 A No, that is strictly
10 between the worker and Alyeska and for the state
11 to intervene in that particular area would be almost
12 impossible under the U.S. Constitution. We can't
13 prohibit the interstate migration of labour.

14 THE COMMISSIONER: Yes.

15 MR. BAYLY:

16 Q All right, now one of
17 the proposals before us, you gave me the example of
18 the Mackenzie Valley, is that southern workers be
19 removed from the camp and from the Northwest Territories
20 for their rest and their relaxation and at the end
21 of their jobs. If your constitution had permitted
22 it, in light of the kinds of things that happened when
23 a large number of workers get laid off, would you
24 recommend that as a device, if you will, for lessening
25 the impact upon state resources?

26 A Under our law the only
27 thing the company could do is buy the man a ticket,
28 and to wherever he wanted to go and throw him out of
29 the camp, and just deny him his bed and meals and
30 camp. Beyond that, if he chose to go out the camp

Parker, Weedon
Cross-Exam by Bayly

1 gate and pitch a tent on the federal domain, why I
2 don't think he could be stopped despite the D.L.M.
3 regulations, so, that is about the best you could
4 do is institute a suasive system where you would
5 encourage people, under our laws.

6 WITNESS WEEDON:

7 A I would answer that quest-
8 ion, yes.

9 Q That you would recommend
10 that as a --

11 A Yes, and the reason is
12 that this would, I believe allow the pipeline workers
13 coming into the state to leave their families behind
14 knowing that in fact there was no incentive, in
15 fact quite the reverse for them to leave them behind
16 ⁱⁿ their traditional home, not establish a new
17 home in Fairbanks, on what would in any case be a
18 temporary basis. That would lessen the total number
19 of social services and costs thereof for the people
20 of that community and the state at large.
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1 interchangeability for jobs.

2 Q Well, they may be skilled
3 people and working on heavy equipment and things of
4 that sort, but the pipeliners themselves by and large
5 come from the south, do they?

6 A Yes. Welders come from
7 Tulsa, and the people with very special pipeline
8 skills are from way out of Texas or Oklahoma.

9 THE COMMISSIONER: I'm sorry,
10 go on.

11 MR. BAYLY: Q Now, Commissioner
12 Parker, one final topic, and that is the one that
13 Mr. Bell was speaking to you about. I wasn't clear
14 from your evidence as to what the rationale was for
15 the policy of Senator Jackson's Committee to settle the
16 land claims prior to construction.

17 A The rationale was that
18 the land freeze was the club by which native claims
19 settlement could be enforced. The general feeling
20 of Secretary Udall, and later Secretary Morton, was that
21 if the land freeze were not maintained in a fairly
22 rigid manner, that there would never be a claims
23 settlement. That was the underlying rationale.

24 Senator Jackson was simply
25 moving to resolve that impasse as rapidly as possible,
26 also carrying forward his expressed desire to achieve
27 a satisfactory settlement of Alaska claims, and he was
28 acting in that role in that particular case, in his
29 role as chairman of the Interior Committee who had
30 jurisdiction in those areas.

Weedon & Parker
Cross-Exam by Bayly

1 Q Now, the freeze prevented
2 the disposal of federal lands prior to the settlement
3 of the claim, but I understand that the route had been
4 determined and chosen by the company and applied for
5 prior to that settlement, is that correct?

6 A I didn't quite understand
7 that.

8 Q The route for the Alyeska
9 line had been chosen prior to unfreezing, if you will.

10 A Yes, the route was largely
11 finalized by the late spring of 1969, and the settlement
12 was not achieved until December of 1971.

13 Q So it was --

14 A The major decision on the
15 route was which pass to take through the Brooks Range.
16 The rest of it fell out fairly easily.

17 Q Yes, so it was possible
18 then to both consider a route and to resolve the
19 question of native land claims at one and the same
20 time, in your experience.

21 A Yes, the only problem
22 being that once you had made your route decision you
23 couldn't proceed any further until something was done
24 about the land freeze.

25 WITNESS WEEDON: Might I
26 just comment?

27 Q Yes.

28 A The company's preference
29 for a route was expressed in early 1969, and at that
30 point it was nothing except a preference of the company.

Weedon & Parker
Cross-Exam by Bayly

1 The withdrawal of the transportation corridors by the
2 Federal Government took place in 1969. It reflected
3 that preference, of course, the Valdez route. It
4 also added what appeared to be a possible alternative
5 which was just south of the Arctic Wildlife Range,
6 and so both of those routes appeared on the maps as
7 withdrawals from the federal public domain in 1969.

8 Now, if in the consideration
9 of the alternative routes the Federal Government had
10 decided that neither of those was really the proper
11 one, they would have at least until the native claims
12 were settled they would have had to face the question
13 of, is it the proper thing to do to permit a right-of-
14 way to be granted for a third, a different alternative,
15 even in the face of the fact that the native claims
16 are not settled, and I don't know, that was a purely
17 hypothetical situation. But after the claims were
18 settled they could still have granted a third or a
19 different right-of-way from either of those two
20 except that if it crossed native lands there would
21 have had to be compensation to the natives for the
22 taking of that right-of-way.

23 Q Yes, and I understand
24 that although hearings were held in Alaska, concerning
25 the environmental impacts of the Alyeska line, that
26 there was no parallel to this hearing, that also
27 discussed the routing. Would that be fair to say?

28 WITNESS PARKER: The hearings
29 in Alaska consisted of two days of hearings in Fair-
30 banks in 1969 at the University of Alaska, and about

Weedon & Parker
Cross-Exam by Bayly

1 three days of hearings in Anchorage in the spring of
2 1971, and hearings also in Washington, D.C. Were
3 there any others, Bob?

4 WITNESS WEEDON: No, I don't
5 believe so. On the occasion of the 1969 hearings,
6 in August of 1969, these were not in essence hearings
7 mandated by law, as I recall it, but were simply held
8 because at that time the first serious questions had
9 been raised in the debate between the Department of
10 the Interior and the applicant company about the
11 proposed route.

12 The hearings in 1971 that
13 Commissioner Parker just mentioned, were formally
14 required hearings under the National Environmental
15 Policy Act, that is it had to do with the draft
16 environmental impact statement.

17 Q Concerning the earlier
18 hearings that weren't a requirement, were these ones
19 to which the general public had access to speak as
20 well as to listen?

21 Witness Parker A Yes. There was -- whenever
22 hearings in the sense of this Inquiry in which the
23 alternate pipeline routes were approached in depth,
24 a battle was largely fought out in the press and a
25 few publications which came out on the matter.

26 Q So it was a question
27 then of the route by itself being discussed in those
28 public hearings, as opposed to any alternates to it?

29 A Yes, the alternates were
30 brought up during the hearings.

Weedon & Parker
Cross-Exam by Bayly

1 But there was, other than what is contained in the
2 environmental impact statement, on the Alaska Oil
3 Pipeline, why that is the sum and substance of the
4 serious examination of alternate routes for the oil
5 pipeline.

6 Q And as a result of the
7 hearings, either the ones that were held in the State
8 of Alaska, or in Washington, were there any substantive
9 route changes to the proposed route that the applicant
10 had put forward?

11 A No. The major change
12 on the applicant's route were two, Anactuvik Pass
13 was the original choice, and this was moved to
14 Dietrich mainly because of soils conditions, both
15 in Anactuvik Pass itself and the lack of gravel in
16 traversing across the foothills of the Brooks Range
17 from the Itkillik Drainage over into the Sagavanerktol
18 Drainage

19 The other change came much
20 later and was a change from Atiqun Canyon to take
21 the pipeline on its present route, which is essentially
22 across the foothills via Toolik and on over
23 into Sag River and that route.

Parker, Weedon
Cross-Exam by Bayly

1 Q Are you able to trace
2 for us where the recommendations came from to make
3 those route changes, whether they were from the
4 public sector, the government or the applicant
5 itself?

6 A The route change from --
7 both route changes were largely the results of
8 dialogue between the federal government and Alyeska
9 regarding the suitability of soils and the
10 general constructability of the particular route
11 under consideration.

12 MR. BAYLY: Thank you,
13 gentlemen, those are all the questions that I have.

14 THE COMMISSIONER: Thank you,
15 Mr. Bayly. Maybe if it is convenient we could stop
16 for an hour for lunch. I think we will only be another
17 45 minutes with you gentlemen, would that be all
18 right?

19 WITNESS WEEDON: Certainly.

20 THE COMMISSIONER: Mr. Marshall,
21 just before we adjourn, yesterday you filed the
22 comparison of costs between the Mackenzie Valley line
23 and the Fairbanks line, the Mackenzie Valley Corridor
24 and the Fairbanks Corridor and this has been marked
25 as an exhibit, and you don't have to answer this
26 now, but I am just trying to understand this. The
27 total capital cost of the Mackenzie Valley pipeline,
28 the total capital cost within Canada is \$7,000,167,394.
29 The total capital cost of the Fairbanks route within
30 Canada is \$8,000,062,556. The total cost of the

1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. MARSHALL: You asked just
3 before the break if I could check on some information
4 that's in Exhibit 287, the cost breakdown that Mr.
5 Gibbs had requested that Mr. Dau provide. I checked
6 with Mr. Dau on the telephone about it, and as I
7 understand it, Mr. Gibbs, it's in the two tables.
8 Firstly, for the Fairbanks corridor, this gives us
9 the cost base in 1974 dollars, and if you look at the
10 last column, the escalated total, you can follow it
11 across and get Canada north of 60 and Canada south of
12 60, and the sub-total for Canada, and the total project
13 cost, which would be the \$10.9 billion.

14 That's the Fairbanks corridor.
15 Go over to the last page, that's the base case, the
16 filed application with the revision south of Caroline,
17 and again you end up with a total project cost in
18 the last column of the last line of \$9.9 billion.
19 So I think your interpretation of it was accurate,
20 sir.

21 If there's anything further,
22 Mr. Dau would be happy to attend.

23 THE COMMISSIONER: No, we won't
24 bring him up here until Mr. Hollingworth wants to
25 cross-examine him, but I just wanted to stay abreast
26 of whatever it was we were learning from this.

27 Well, where are we now?
28 Mr. Hollingworth.

29 MR. HOLLINGWORTH: I won't be
30 very long, Mr. Commissioner.

Weedon & Parker
Cross-Exam by Hollingworth

ROBERT WEEDON and
WALT PARKER, resumed:

CROSS-EXAMINATION BY MR. HOLLINGWORTH:

Q Mr. Parker, this morning in cross-examination by Mr. Bell I just wanted to make sure that I had what you said and what Mr. Bell said clearly. I understood that Mr. Bell asked you if use of the winter road between Fort Simpson and Fort Nelson was probable, and my understanding is that your answer to that was "yes." Did I interpret that correctly?

WITNESS PARKER: I didn't mean for that to come out quite in that manner. Whether a road would actually be used, I have absolutely no knowledge of that. I was merely indicating, merely replying as to our general level of experience with winter roads and whether they can be used to move freight, and yes, they can, if you accept the time constraints and the other problems with moving large amounts of freight on a winter road.

Historiaally they've always been used to move small amounts of freight in moving -- well, what I guess it gets down to is what you want to do with it.

Q So the answer is really "Yes, probably the road could be used for using freight," is that a fair answer then?

A Yes.

Q Fine; and then dealing with the welding on the Alyeska line, you stated that

Weedon & Parker

Cross-Exam by Hollingworth

1 you thought the welding was unsatisfactory below minus
2 10 degrees Fahrenheit or minus 15 degrees Fahrenheit,
3 and that Alyeska had stopped welding at those temperature
4 levels.

5 A The last time we dis-
6 cussed it, that was the consideration they were using,
7 and of course if they went to better insulation, or the
8 tents that they had put over the pipeline, or had more
9 heating capacity to heat the metal to bring it up to
10 acceptable levels for welding, why then they could
11 lower their temperature accordingly. It's a matter of
12 procedures, but the welding specifications are very
13 clear as to what the temperature of the metal must be
14 before welding begins, and that is the controlling
15 factor.

16 Q Well, are you aware of
17 whether the metal properties of the Alyeska pipe
18 are identical to the metal properties proposed for
19 either the Arctic Gas scheme or the Foothills scheme?

20 A No, I don't believe that
21 pipe has been ordered, and I have certainly not seen
22 any specifications for it. The cold weather prop-
23 erties of the Alyeska pipe is excellent, the best I've --
24 I say the cold weather properties of the pipe for the
25 Alyeska Pipeline is excellent, the best that anyone
26 in my experience has ever encountered. The Japanese
27 did a superb job with it.

28 Q But is it not true that
29 the welding properties of pipes can differ because of
30 the makeup in their metallurgical content?

Weedon & Parker
Cross-Exam by Hollingworth
Cross-Exam by Scott

1 A Oh, certainly. That's
2 what you have to work out. That's what we worked out
3 rather laboriously with Alyeska.

4 MR. HOLLINGWORTH: Fine, I
5 have no further questions, thank you.

6 THE COMMISSIONER: Mr. Scott?

7 MR. SCOTT: Mr. Commissioner,
8 everybody's oxes are being gored in this exchange so
9 I am a little reluctant to begin; but perhaps I could
10 begin by asking Dr. Weedon a couple of questions about
11 the Porcupine caribou herd.

12
13 CROSS-EXAMINATION BY MR. SCOTT:

14 Q Before doing so, doctor,
15 I understand that you are generally familiar with the
16 Arctic Gas proposal, at least as it affects the State
17 of Alaska.

18 WITNESS WEEDON: Yes.

19 Q And I take it from what
20 you've said earlier that you had certain reservations
21 about the capacity to perform according to the proposal,
22 for example, you have reservations about the ability of
23 CAGSL to construct the Alaskan portion in one construc-
24 tion season.

25 A Yes.

26 Q Well now, in terms of
27 these questions I would appreciate if you could leave
28 aside your reservations about their capacity to perform
29 and assume with me, for the moment, that with respect to
30 their proposals, their method and timing of construction

Weedon & Parker
Cross-Exam by Scott

1 and their maintenance and operations procedures that
2 the work can proceed as planned. Are you with me now?

3 A Yes.

4 Q All right. Well now, in
5 that context, what would you predict regarding the
6 magnitude or importance of the impact of the project --
7 I want you to think about the project only -- on the
8 Porcupine caribou herd?
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1 A May I ask a question?
2 Do you mean over the entire life of the project?

3 Q Yes, I may ask you to
4 break it down to deal first with the construction
5 impact and secondly with the life of the project
6 impact, but in answering the question I would like
7 you to take two things as assumed. First of all
8 that the specifications for work can be complied
9 with and secondly to consider the impact of the
10 project alone, absent other exploration and like
11 work.

12 A I am afraid that I
13 simply cannot make that kind of estimate. It would
14 be trying to extend beyond my own knowledge of that
15 particular situation of the Porcupine Caribou herd
16 and all of the details of the project.

17 Q Well, how is it, if I
18 may ask, then that you are able to make a more general
19 prediction about the impact on the Caribou herd
20 when you add in the variables with respect to the
21 project that you anticipate and other projects?

22 A I think my point is
23 that we do have reservations about the ability of
24 the applicant actually to do the work in the manner
25 stated in their application, but leaving that aside
26 we are also convinced, at least on historic evidence
27 in Alaska, that the project will have this very strong
28 effect of triggering further non-pipeline associated
29 projects in that same general area. I am
30 expressing an apprehension on the part of people who

Parker, Weedon
Cross-Exam by Scott

1 know the Caribou situation there that the net result
2 of all of those projects will be detrimental to the
3 caribou.

4 Q I am prepared to accept
5 your statement this morning that the presence of
6 man and his works has never been seen as an advantage
7 for the caribou. I accept that. I understand you
8 to say that looked at in terms of an opening of the
9 Northwest, not only to a pipeline, but to all kinds
10 of exploratory and other works, there will be impact
11 on the caribou herd, is that generally what you
12 are saying?

13 A Yes.

14 Q Are you capable of making
15 any assessment about what the impact of the construction
16 of this project will be? Large, medium, small or
17 is it just in the realm of pure conjecture?

18 A We don't know whether it
19 would be helpful to give an answer to that. The
20 project itself under the conditions that you outlined
21 would have a small effect on the caribou relative to
22 the total effect which we are predicting as a result
23 of all of the activities. You know, I honestly cannot
24 quantify beyond that point, what the effect of the
25 project, assuming all of the assumptions that you
26 made, would have on the caribou, I cannot answer
27 that.

28 Q All right, well then
29 in terms of the --

30 THE COMMISSIONER: Excuse me,

1 I think that Mr. Parker wanted to answer.

2 MR. SCOTT: I am sorry.

3 WITNESS PARKER:

4 A If I understand it,
5 your assumptions are that Arctic Gas would be in and
6 out of the area in one winter construction season
7 and that the pipeline would be buried --

8 THE COMMISSIONER: And there
9 would be no additional -- nothing else would ever
10 happen.

11 A Just the compressor
12 stations would then be the only impact -- well, the
13 caribou, as we know, would not normally be there except
14 for a few stragglers in the winter and the pipeline
15 will be buried, so the impact will be that of the
16 compressor stations, and I guess beyond that it is
17 impossible to go. Whatever the impact of the compressor
18 stations would be would be what you would have.

19 MR. SCOTT:

20 A Well, then if we look
21 at it this way, if we look at Arctic Gas alone and
22 I recognize your judgment that that is unrealistic,
23 but if we look at them alone and do not for the moment
24 hold them responsible for what may follow, would it
25 be fair to say that the impact of the pipeline built,
26 as they contemplate it to be built, upon the Porcupine
27 Caribou herd will be very modest?

28 WITNESS WEEDON:

29 A Yes, I think that is
30 correct.

1 Q And is it likely in
2 your judgment that whatever impact occurs on the
3 caribou herd will be principally the result of the
4 project itself or increased hunting and hunting
5 pressures?

6 THE COMMISSIONER: Or some-
7 thing else.

8 MR. SCOTT: Or something
9 else.

10 A I was going to say neither
11 of those two. As I explained before I feel that
12 hunting is relatively easily controlled, but the
13 effect of the triggering action, if there is such a
14 thing and I believe that there would be on further
15 oil and gas developments in that area, is what really
16 concerns me. That is the variable that I see as
17 the greatest source of concern.

18 Q Well, now taking whatever
19 impact there will be on the caribou as the result of
20 this project, if it is built, at what stage of the
21 life cycle of the caribou is the impact likely to be
22 maximum? .

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Weedon & Parker
Cross-Exam by Scott

1 A I would say in summer.

2 And let me ask you to
3 ask the question again, are you dealing strictly with
4 the Arctic Gas project now, or with the total -

5 MR. SCOTT: Well, let's deal
6 first with the Arctic Gas project.

7 A Well, again with the
8 scenario that the applicant has laid out here, then
9 as Mr. Parker said, the effect would be basically
10 limited to that, whatever effect the compressor stations
11 and the summertime maintenance of the stations and the
12 line, or surveillance, would have on the caribou herd
13 that summer in that area. So seasonally it would be an
14 effect in summer on the caribou that both calved in
15 that area and spend the summer along the coast and take
16 advantage of the winds, and it would be the effect of
17 the compressor stations and the maintenance or
18 observation of the line.

19 Q Well now, if we expand
20 the question to include not only the construction of
21 the pipeline by Arctic Gas, but the ventures and the
22 exploration work, and drilling work that may follow
23 in its wake, then what do you say about the impact on
24 the life stages of the caribou, are we concerned about
25 migration or calving or both?

26 A Again, to my knowledge,
27 the caribou or no major portion of that herd spends
28 the winter in that area north of the Brooks Range.
29 Hence any effect on them would either be through an
30 effect on their range, and presumably there would be

Weedon & Parker
Cross-Exam by Scott

1 some effect on the actual plants they eat in the
2 summertime, even from wintertime operations, but more
3 than that, it would be the effect of the operations
4 while the caribou are there on the summer range and
5 their activities include calving and local migrations.

WITNESS PARKER.

6 To followup on that in my
7 involvement with this was with the Melchena herd
8 where we had certain unexplained factors that could
9 not be explained by hunting pressure or range, and
10 it seemed that the next thing we could isolate was
11 stress during breeding periods. Well, stress during
12 breeding and stress while the cows are carrying, and
13 this is an area we know very little about. The Depart-
14 ment of Fish & Game is working on it, but it's not an
15 area on which you acquire knowledge easily, and only
16 something you acquire on a long-range project.

17 So it's very difficult to
18 ultimately say what the effect of increased intrusion
19 is going to be in this particular regard. We suspect
20 that the intensive use of snow machines and other
21 all-terrain vehicles has led to a considerable decline
22 in fertility over-all, but we can't prove it.

23 Q Well, Dr. Weedon, then
24 would it be, if you took this project plus as you see
25 it, the consequent developments, do I understand that
26 the effect on the caribou would be really twofold:
27 (1) in terms of their ability to successfully calf in
28 their traditional calving area, and
29 (2) a reduction in size of their range.

30 WITNESS WEEDON: And also

Weedon & Parker
Cross-Exam by Scott

1 the -- and maybe it's part of your understanding to
2 your answer -- but any effective cutting off of the
3 caribou from the coastal areas where they go to escape
4 the flies in mid-summer, and either physically cutting
5 them off, or making the area so busy in terms of human
6 activities that they simply will not stay there.

7 Q Well now, as I think
8 we've seen, the applicant's prime route along the ocean
9 and their interior route would cross different parts
10 of the range of the caribou herd, and the Fort Yukon
11 corridor would also appear to intersect with the caribou
12 range in part. Which of these alternative routings,
13 in your opinion, would have the greatest impact, ^{is} that
14 is the greatest adverse impact, I presume that it/what we are
15 talking about, on the herd considering if we can for
16 the moment only the impact of the project itself?

17 A I would still have to
18 say the coastal or prime route, at least as -- yes, I
19 think that's accurate, the coastal or prime route

20 Q Is most adverse?

21 A Yes.

22 Q And next is the interior
23 route?

24 A Yes.

25 Q And then the Fort Yukon?

26 A Yes.

27 Q Let me ask you this: If
28 we take the project plus all the consequent developments
29 that you envisage, ^{do} you alter your ratings in any fashion
30 because of that?

A That becomes extremely

Weedon & Parker
Cross-Exam by Scott

1 difficult to answer, for at least one basic reason,
2 and that is that in the routes other than the prime
3 route, the Fort Yukon and interior corridors, you are
4 dealing with forested or partly forested areas that
5 are used by the caribou in winter, and if the activities
6 -- increased activities of people in those corridors,
7 and especially the interior route, were to lead to
8 an increase in forest fires in that area, then I
9 think there would be rather severe damage -- or you
10 know again, using the assumptions that forest fire
11 fighting would be no more effective in that area than
12 it has been elsewhere in Alaska, etc., I think you
13 can postulate that there would be major losses to
14 the caribou winter range. The question you're
15 asking really, is that potential loss of winter range
16 worse for the caribou than the potential loss of the
17 calving area? Unfortunately caribou have to live at
18 all times of the year, they just can't live on a
19 part-time basis.

20 Q Well, I understand your
21 rating, if I can informally call it that, of the three
22 routes, attempting to measure the impact of the
23 project alone and I don't think anybody really disagrees
24 with that rating as far as I know; but now we come to
25 the project plus its consequent development, and I take
26 it that the consequent development is more likely to
27 be pronounced on the prime route than on either of the
28 interior routes.

29 A I think that's correct,
30 at least if you are concerned with the known potential

Weedon & Parker
Cross-Exam by Scott

1 now for major oil and gas discoveries. There seem to be
2 -- there is more likelihood of such discoveries in the
3 north of the Brooks Range area than south.
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Parker, Weedon
Cross-Exam by Scott

1 Q With that factor in
2 the scale, does that induce you to alter your ratings
3 when you measure the impact of the whole combination
4 of forces on the Porcupine Caribou herd?

5 A Well, my rating as I
6 remember it is worst rating for the Prime Route and
7 less for the other two.

8 Q Yes, and you hold with
9 that--

10 A I think so --

11 Q Either in the broader
12 picture?

13 A Yes.

14 MR. MARSHALL: Contrary
15 to Mr. Scott's assumption, not everybody does agree
16 with Dr. Weedon's rating --

17 A I would be surprised
18 if everyone did.

19 MR. MARSHALL: --- and we
20 will have some evidence later on, Mr. Scott.

21 MR. SCOTT: Well, let me
22 put it this way, everybody I have heard.

23 THE COMMISSIONER: Those in
24 the know.

25 MR. SCOTT:

26 Q Now, Dr. Weedon, could
27 I ask you one or two questions. It may bore my
28 colleagues, because they may understand from the
29 answers that have previously been given, but I am not
30 sure I do, and I will just take a moment to see if you

1 can help me. I take it that the wildlife range as it
2 presently exists permits development, either exploratory
3 or productive or pipeline by order of the Secretary
4 of the Interior?

5 A At the present time
6 none of those activities except purely surface ex-
7 ploration for minerals is allowed. The Secretary,
8 on his own, could take positive action of various
9 sorts to permit the pipeline crossing or to lease
10 the area for oil and gas.

11 Q But what I am getting
12 at is when we take the range as it now exists, what
13 stands between now and continuation of its present
14 uses, is the willingness of unwillingness of the
15 Secretary to act. In other words, he can stipulate
16 any kind of exploration or use that he desires within
17 that range?

18 A That is correct, and
19 the only qualification is that if Congress so decides,
20 they can at any time pass a new law which establishes
21 all or a part of the range for some particular use,
22 and therefore restricts the Secretary's decision
23 making ability thereafter.

24 THE COMMISSIONER: If Congress
25 passes a law designating the range as Wilderness with
26 a capital "W", that would mean the Secretary would have
27 no power thereafter to allow a pipeline or anything
28 else, is that right?

29 A That is correct. There
30 are certain types of uses of an area, even certain

Parker, Weedon
Cross-exam by Scott

1 types of industrial uses of areas allowed under
2 the 1964 Wilderness Preservation Act, but I do not
3 believe that the Secretary would be able to allow
4 passage of oil and gas pipelines.

5 THE COMMISSIONER: Excuse
6 me, right now you mean he couldn't.

7 A No, I am saying
8 subsequent to the establishment of that area as a
9 Wilderness Area.

10 Q Then if that were
11 established by Congress as a Wilderness Area, then
12 subject to further action by Congress there would be
13 no pipeline across the range?

14 A I think that is correct,
15 yes.

16
17 Q So that the situation
18 at present, when the area is arranged, is that the
19 uses that are permissible are at the stipulation of
20 the Secretary.

21 A Yes.

22 Q When and if by act of
23 Congress if becomes a Wilderness, then I take it the
24 independent action of the Secretary without the
25 concurrence of Congress forecloses for all practical
26 purposes, exploration, pipelines, drilling and so
27 on.

28 A Yes. I might add, how-
29 ever, that at present the Secretary does not have
30 complete freedom because Congress in establishing the

Parker, Weedon
Cross-Exam by Scott

1 range fairly clearly spelled out its general purposes
2 with respect to that area, that is, preservation of
3 unique wilderness, wildlife and recreation experiences
4 and because of that the Secretary would find himself
5 in very deep hot water if he took an action contrary
6 to that general purpose.

7 Q Yes, but now I take it
8 that the limits of the range at the north are essentially
9 the shorelines, is that correct?

10 A Yes, except for the
11 area around Kaktovik, within the area, that is, within
12 the Native land selections of that village.

13 Q Yes, but there the
14 limits are further inland in effect?

15 A Yes, otherwise it's the
16 shore as far as I know.

17 Q Yes, and if a Wilderness
18 Area were declared, again it would not exceed the
19 boundaries of the range at the shoreline.

20 A It could not, that
21 is correct.

22 WITNESS PARKER:

23 A May I interject. There
24 have been recent developments in the federal sector
25 which indicate that some of these designations may
26 be carried to three miles. This has not received
27 testing in the courts and I don't believe has received
28 any congressional action. This is originating in the
29 Interior, but we have seen proposals on the so-called
30 D-2 lands to go before the Congress which carry the

Parker, Weedon
Cross-Exam by Scott

1 boundary of the designated areas to three miles.

2 Q Well, let's just pretend
3 for the moment that that three mile extension is not
4 going to be something that the Congress is going to
5 be able to take advantage of. I take it that
6 absent that possibility, the Wilderness, capital
7 "W" will extend generally to the shoreline?

8 WITNESS WEEDON:

9 A Yes, or it could if
10 Congress decided to do so.

11 Q But no further.

12 A That is correct.

13 THE COMMISSIONER: Well, if
14 it encompassed the same boundaries as the range does,
15 it would?

16 A Yes. May I interject
17 here that there is a --

18 MR. SCOTT: I was coming
19 to the "snapper", as you put it the other day, but
20 go ahead.

21 A I was just going to say
22 that there is a draft proposal prepared by the manager
23 of this range, the Fish and Wildlife Service, in
24 -- oh, I forget what year -- 1970, approximately, which
25 was a proposal by that agency to establish a Wilderness
26 Area covering approximately 99% of the total land
27 acreage of the range.

28 Q And I take it that offshore
29 of the range, the waters and the land under the waters
30 is owned or controlled by the State of Alaska?

Parker, Weedon
Cross-Exam by Scott

1 A Yes, from mean high
2 tide out for three miles.

3 Q Well, now, if Congress
4 declared the range to be a wilderness to the shoreline,
5 has the State of Alaska taken any position as to whether
6 it will permit exploration and development in the
7 sea?

8 A No, it has not.

9 Q So I take it that you
10 are not able to tell us, at this present time, that
11 even if this were declared a wilderness that there would
12 be no exploration or development for oil and gas
13 resources offshore adjacent to the wilderness?

14 A That is correct.
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Weedon & Parker
Cross-Exam by Scott

1 Q If I could just refer --

2 A That's also true of the
3 federal lands and the outer continental shelf beyond
4 the three-mile limit.

5 Q Yes. What I was getting
6 at is I am sure you can see, is that even if the land
7 be declared a wilderness, that will not, as matters now
8 stand, preclude the State of Alaska from permitting or
9 indeed perhaps even encouraging exploration and devel-
10 opment for oil and gas offshore the wilderness land.

11 A But no facilities for that
12 development could be located on-shore.

13 Q And let me just read a
14 sentence from Mr. Collins' evidence, which you may or
15 may not have heard, I'm not sure.

16 A I believe I was here,
17 sir.

18 Q He said -- and he's speak-
19 ing of the off-shore situation:

20 "The off-shore situation is said to be promising
21 more or less all the way across the ocean floor
22 out from the projected International Wildlife
23 Range . If this is significant of future
24 development, there will be many pipelines of
25 course, inter-connecting wells and trunk lines
26 both oil and gas, and it is not conceivable that
27 the wildlife habitat -- that is the range and
28 its surroundings -- will escape invasion. On a
29 nationalistic basis the oil and gas found off-
30 shore on the Alaska side would come out to market

Weedon & Parker
Cross-Exam by Scott

1 via Alaska and those resources found on the
2 Yukon side would come out through Canada. but
3 the Wildlife Range would still be in the
4 middle and would still suffer invasion, regard-
5 less of which way Prudhoe Bay gas comes outside
6 as the first order of business next to the oil."

7 Now first of all do you agree with that statement?

8 MR. HOLLINGWORTH: What page
9 is that, Mr. Scott?

10 MR. SCOTT: Well, it's paragraph
11 No. 5 of the summary of Mr. Collins' evidence. If it
12 would be helpful I'd be glad to show it to you.

13 A Do you know whether Mr.
14 Collins was talking about the International Arctic
15 Wildlife Range in Yukon, or was he talking about the
16 Arctic Wildlife Range in Alaska, or both?

17 Q I think he was talking
18 about both, and just so my friends will know, he
19 read this into the transcript at page 7288.

20 THE COMMISSIONER: Just show
21 that to Dr. Weedon. 7288, let's just make sure we've
22 got this.

23 A Now once again, Mr.
24 Collins was apparently assuming that Congress would not
25 establish the uplands of the range, the Alaskan
26 Wildlife Range, as wilderness.

27 MR. SCOTT: I think that's
28 correct. He's talking in that paragraph not about a
29 capital W Wilderness, he's talking about the existing
30 Wildlife Range, and the first question I have for you

Weedon & Parker
Cross-Exam by Scott

1 is, do you agree with his comments in that context?

2 A Yes. I think, at least,
3 unless I'm very confused, that this is essentially
4 the same statement that I have made, that the Arctic
5 Wildlife Range, unprotected by some sort of no-trespass-
6 ing signs, as it were, would be subject to many develop-
7 ments based on the existence or probably existence of
8 both on-shore and off-shore non-renewable resources.

9 Q Well, what troubles
10 me, you see, is that without a stipulated assurance
11 from the State of Alaska that they will not permit
12 oil and gas development or exploration off-shore even
13 when a wilderness is declared, how can we have any
14 assurance that that eventuality will not occur? With
15 the result on the wilderness that seems obvious.

16 A But I'm not quite sure
17 what result on the wilderness you're talking about.
18 If the uplands cannot be used as locations for storage
19 or supply depots and docks and roads and so on, then
20 I'm not quite sure what effects on the wilderness
21 you're really talking about.

22 Q Well, what I'm referring
23 to is if it were possible to develop or explore for
24 oil and gas off-shore in the wilderness, even without
25 staging areas in the wilderness, I think you would
26 agree with me that that's going to have impact, adver-
27 se impact on the wilderness itself.

28 A Yes, I'm sure it would to
29 some degree, and that is to the limits of the noise
30 vibrations or whatever air traffic, etc., that's correct.

Weedon & Parker
Cross-Exam by Scott

1 Q So that if the foothills,
2 for example, on the shore of the wilderness area, are
3 used as a calving ground for example, to take only
4 one biological use, any off-shore development may
5 adversely impact that biological use, if it were to
6 occur.

7 A It might.

8 Q Yes.

9 A Much less than a combina-
10 tion of off-shore and on-shore, however.

11 Q I agree, but it might
12 impact it nonetheless.

13 A yes.

14 Q What I'm saying is, isn't
15 there a grave risk that until we have an assurance from
16 the State of Alaska that that will not occur, in the
17 face of a declaration of wilderness, that there is a
18 possibility of impact in any event?

19 A Yes. I would like to
20 point out that the State of Alaska has been considering
21 whether to lease for oil and gas development tracts
22 of state land off-shore from this general Beaufort
23 Sea area. However, the area under consideration by
24 the state does not go beyond, that is eastward of
25 the westernmost boundary of the Arctic Wildlife Range.

26 Q You would agree with me
27 that if, contrary to its present policy, the State of
28 Alaska were to go further and lease areas adjacent
29 to the wilderness range, that would seriously damage the
30 possibility that the range would be declared a

Weedon & Parker
Cross-Exam by Scott

1 wilderness.

2 A It would suggest that the
3 state did not value wilderness on-shore very highly.
4 That is at least on that coastal strip, that is correct.

5 Q It would make it very
6 difficult, wouldn't it, to get a wilderness declaration
7 through the Congress in the face of such acts, if they
8 occurred?

9 A Oh, it depends on what
10 the other 49 states wanted to do, actually.

11 WITNESS PARKER: Mr. Scott,
12 I doubt very much if what happens on the west side of
13 the Canning River is going to influence the action of
14 the Congress on the east side. The normal situation
15 in wilderness areas is that while it's desirable that
16 they have some kind of buffer or something, this is not
17 one of the positive requirements of the Act. There
18 certainly has been activity on the west side of the
19 Canning in past years, not in recent, but in '69 and
20 '70 there was activity there, and I don't think it's
21 quite the factor that you're portraying it to be.

22 Q No, I agree, commissioner,
23 that what happens on the west side of the Canning
24 River isn't likely to effect the attitude of Congress
25 or the other states to what happens on the east side
26 of the Canning River. The point I make to both of you
27 is that central to your view and the state's view that
28 the shore route is not a good choice, is because it
29 will impede or make it possible, I think virtually, if
30 adopted, the declaration of wilderness in that north-east

Weedon & Parker
Cross-Exam by Scott

1 corner of the state. That's the thrust of your statement
2 to us, and what I say is that preceding that, surely,
3 if the north-east is at stake as a potential wilder-
4 ness, would come a declaration from the State of
5 Alaska that it did not propose, in the event that this
6 was declared a wilderness, to permit off-shore drilling
7 or exploration adjacent to the wilderness. That we
8 haven't had, as I understand.

9 A That is correct.

10 Mr. Scott, I think the reason that has not been had
11 is because no one has asked for it and Congress
12 has not begun seriously to consider wilderness status.
13 Wilderness status is not a part of the D-2 contro-
14 versy, and there's been no indications that anyone is
15 going to interject it at this time. So I think that
16 one can hardly expect the state to respond to a
17 situation which is somewhere in the far future.

18 Q But am I correct that
19 there has been no declaration by the state that if
20 this were declared a wilderness it would not permit
21 adjacent off-shore exploration and development?

22 A That's correct, and because
23 there's been no declaration because it's never been
24 asked.

25 Q It's an "After you
26 Alfonse, situation."

27 A Right.

28 THE COMMISSIONER: May I just
29 ask a question? If you -- well, all right, at the
30 present time you have the Arctic National Wildlife

Weedon & Parker
Cross-Exam by Scott

1 Range in the north-east corner of Alaska lying between
2 Prudhoe Bay and the Canadian border. If that is
3 designated as a wilderness by Congress, then there
4 will be no Arctic Gas Pipeline along the coast to the
5 Canadian border.
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Parker, Weedon
Cross-Exam by Scott

1 That would leave open the
2 Interior Route of 'the range.

3 Now, we at this Inquiry have
4 had proposals that Canada should establish an
5 Arctic Wildlife Range contiguous to yours and it would
6 really cover the whole of the Northern Yukon from the
7 Porcupine River north to the Arctic, to be very, very
8 rough about it all.

9 Now, if you do designate
10 this as a Wilderness Area, it means that Arctic Gas
11 cannot build that pipeline along the coast which
12 is their preferred route, their prime route. As far
13 as environmentalists are concerned, and all who have
14 given evidence say that the Interior Route would
15 cause a good deal more environmental damage in a
16 broad sense than the coastal route. From Arctic
17 Gas's point of view the Interior Route, in addition
18 to causing greater environmental damage, costs
19 \$500 million more to build, which even in the circles
20 in which they move is not inconsiderable, so a
21 great deal depends on the attitude that first of all
22 the Secretary, and secondly the Congress -- or first of
23 all the Congress and secondly the Secretary, adopt
24 toward that range, will the Secretary allow a pipeline
25 to go through? If he does, what would be the reaction
26 in Alaska and the lower 48? Is Congress likely to
27 designate it a Wilderness Area? Those are questions
28 that are essentially political in nature, but since
29 you gentlemen are here, are you able to say whether
30 you have any views regarding the likely outcome in

Parker, Weedon
Cross-Exam by Scott

1 terms of the status and the future of that range?
2 Is it likely that a pipeline will be allowed to be
3 built across it? Is it likely that it will be
4 designated a Wilderness? Now, having regard to the
5 success you had in your opposition to the pipeline
6 in Alaska, you may not wish to comment, but what
7 do you think? If you are able to answer it at all,
8 if you can't I will understand perfectly.

WITNESS WEEDON:

9 A Mr. Commissioner, in
10 my view, Congress will not ask the question about
11 Wilderness status for the Arctic Wildlife Range
12 before considering the route of the pipeline. That is ,
13 it will not say, "Is this a good wilderness area and
14 let's designate it as such", because immediately it
15 would be faced with the consequence of that decision
16 on the routing decision.

17 Contrary to that I feel
18 that the immediate decision facing Congress and facing
19 the Secretary is where will the gas route be authorized.
20 That question will be answered first. If the answer
21 is, that the route shall go through the Arctic Wildlife
22 Range, then the only question of wilderness that
23 remains is what portion other than that which the
24 gas pipeline affects can be designated, should be
25 designated as wilderness, but there will no longer
26 be the full option.

27 If on the other hand the
28 Secretary or Congress or F.P.C. or all of them or the
29 President or the King of Saudi Arabia decides that
30 in fact some other route other than the Prime Route

Parker, Weedon
Cross-Exam by Scott

1 is the preferable one, then we still can ask the
2 question of wilderness having set aside this other
3 thing.

4 I may have just talked double
5 talk, but I am just simply saying that right now
6 the question of getting gas out is uppermost in the
7 Congress's mind.

8 MR. MARSHALL: Excuse me,
9 Mr. Commissioner, with respect to the point that has
10 just been under consideration, my recollection had
11 been that some of the witnesses in Whitehorse had
12 dealt with this. I think that Dr. Leonard dealt
13 with it to some extent and you might look at 7318
14 of the transcript. I had asked him if the
15 Secretary was authorized to permit the granting of
16 an easement for a pipeline across the Wildlife Range
17 and he referred us to a 1973 legislation, a special
18 act of Congress, and he goes on at the bottom of
19 the page, he says at line 22:

20 "So then Congress took its hands and passed
21 the amendment to the Mineral Act which
22 provides very simply that rights-of-way
23 through any federal lands may be granted
24 by the Secretary of the Interior for pipeline
25 purposes." The next paragraph is definitions:

26 "For the purposes of this section
27 federal lands means all lands owned
28 by the United States, except lands
29 in the National Parks system."

30 Now, over the page it is not completely clear to me

Parker, Weedon
Cross-Exam by Scott

1 if there is a line missing or something. He goes on
2 to make reference to lands held in trust for Indians
3 or Indian tribes and lands in the outer continental
4 shelf, which I take it may be an exception to the
5 definition, but the impression I was left with by
6 that answer and perhaps should be clarified if
7 it can be is that all lands owned by the United
8 States would include lands in a wilderness area.

9 A It would seem then
10 that there are two acts of Congress which oppose
11 each other. The Wilderness Preservation Act of
12 1964 which prohibits pipelines in an established
13 wilderness area and this other act, to which you
14 referred, which is, I believe, the Mineral Leasing
15 Act Amendment of 1973. I certainly am not going
16 to lay bets on which of them is paramount.

17 MR. SCOTT:

18 Q Dr. Weedon, the point
19 that I was trying to make, and perhaps it is clear,
20 but the Commissioner indicated that there were two
21 units which were involved in this process. One
22 is the Secretary of the Interior while the matters
23 of range and one, the Congress, which if it acts,
24 may make the range a wilderness. But I take it that
25 we are agreed that there is a third unit, that is
26 the State of Alaska which either before or after the
27 declaration that the range is a wilderness can impact
28 the area to a greater or lesser degree by permitting
29 oil or gas exploration on its own lands adjacent
30 offshore of the wilderness.

Parker, Weedon
Cross-Exam by Scott

1 A That is correct, and

2 WITNESS PARKER:

3 A And Mr. Scott, the
4 state is very tender in its position in the way it
5 handles its tidelands, not only in reference to the
6 issues onshore, but certainly in reference to the
7 outer continental shelf policies of the federal
8 government and we watch all of them very carefully
9 and what we do in the Beaufort Sea is going to have
10 some effect on what the Federal Government does in
11 the Gulf of Alaska in the Bering Sea and in all our
12 offshore areas in the same way what we do in the
13 Gulf of Alaska tidelands can affect what the federal
14 government will do in the Beaufort Sea.

15 So we have to play this on
16 a statewide scale and cannot isolate our decisions
17 in the Beaufort Sea from the whole dialogue which
18 we have underway with the federal government on the
19 outer continental shelf.

20 Q I think the point that
21 really troubles me is if you take Mr. Collin's
22 statement about the inevitability of extraction of
23 oil and gas wherever it may be found, if that is
24 what it means, it rather casts doubt on the possibility
25 that even with the declaration of a wilderness,
26 the offshore oil and gas will remain immune from
27 exploration and development.

28 WITNESS WEEDON:

29 A You could also say, I
30 think, that even if, number one, Congress established

1 the Arctic Wildlife Range as wilderness, and
2 number two, the State of Alaska said, "We will honour
3 that by prohibiting leases in the area out to
4 three miles", the federal government could beyond
5 three miles lease its outer continental shelf lands
6 and make it impossible for the state to honour
7 its promise, because otherwise we would be subject
8 to drainage of our reserves from outer continental
9 shelf activities --

10 Q To say nothing about
11 the Canadian Government --

12 A That is correct.

13 Q -- in adjacent areas.

14 A And maybe you have some
15 slant drilling techniques that allow you to -- well,
16 I won't go into that. But in any case, in fact,
17 we all do, and I think the basic point of this, we
18 all do have to have some means of meshing our priorities
19 and our plans to come up with some kind of a general
20 and comprehensive and broadly based plan for the
21 development of that entire northern region, because
22 we are so independent on one another's decisions.

Weedon & Parker
Cross-Exam by Scott

1 Q Perhaps what I'm getting
2 at is that if you take Mr. Collins' statement -- and
3 perhaps I've just stretched it a little bit, he's
4 only talking about a range -- and if you take what
5 you say about the rights of the State of Alaska on
6 off-shore lands and the rights of the Federal Govern-
7 ment, to say nothing of the rights of the Canadian
8 Government in adjacent oil and gas territory off-shore,
9 we may be attempting to preserve a wilderness by
10 refusing permission for a pipeline, that will be
11 impacted in any event over the long term. Is that a
12 real risk?

13 WITNESS PARKER: Mr. Scott,
14 I would like to address that at some length. You left
15 one factor out in the triad which you developed. The
16 President of the United States has expressed himself
17 rather clearly on oil and gas development, on energy
18 development in general, and that in essence is the
19 policy that in Interior is carrying out. I think
20 it is fair to express it that the federal policy at
21 the moment is yes, we will develop oil and gas
22 wherever it is found. This is very clearly not the
23 policy of the State of Alaska, as many, many statements
24 of the Governor have revealed. His statements reference
25 Katchumak Bay are best known, but the policy of
26 the state as I said, as expressed by the governor, is
27 expressed by the Commissioner of Natural Resources, by
28 Dr. Weedon and almost everyone else who has spoken for,
29 is that living resources will have priority over oil
30 and gas development in those areas where the habitat

Weedon & Parker
Cross-Exam by Scott

1 of those living resources is identified as critical or
2 even in some cases as sub-critical, and that is our
3 policy and I don't like to speak for the Federal
4 Government, but I think that has been very clearly
5 expressed. Beyond that I don't think we're prepared to
6 go at this time.

7 Q No, but let me make clear
8 that insofar as my personal opinion, if there's any
9 weight in it, and obviously has none, , I'm all in
10 favor of wilderness areas, but what I fear in the
11 scenario that is at least possible here is that we
12 will deflect the pipeline to some other route, conscious
13 of one's wilderness concern in the north-east of
14 Alaska, only to find that that area is ultimately impac-
15 ted by oil and gas exploration off-shore.

WITNESS WEEDON:

16 A I guess my philosophy is
17 simply that just because there are other battles on the
18 horizon, doesn't prevent you from trying to win the
19 one that's at hand.

20 Q I guess, Dr. Weedon, it's
21 the optimist versus the realist. You may win that one.

22 WITNESS PARKER: But I think,
23 Mr. Scott, all we offer you is the past performance
24 of this administration, and since it's only been in
25 power a year, well it doesn't take that long to research
26 the track record.

27 Q I didn't intend to
28 suggest that any other political party would be able
29 to do a different or better job. Commissioner Parker,
30 in the transcript on page 7518 and 19, which was your

Weedon & Parker
Cross-Exam by Scott

1 evidence given in chief at Whitehorse on the 14th,
2 you were dealing generally with the history of,
3 the history and development of the transportation
4 corridor concept, and you referred to the fact that
5 the transportation corridors were early advanced by
6 conservationists and environmentalists in Alaska and
7 elsewhere as a means of defining where surface trans-
8 portation facilities should be located in order to
9 limit their impact upon the wild lands and the wilderness
10 areas. You also gave, I think, a number of other
11 potential justifications-- connected justifications
12 for the use of corridors such as the multi-utilization
13 of resources pads and so on.

14 You go on to deal with the
15 application of this concept in Alaska. I, in reading
16 your evidence, I was unfortunately unable to be there,
17 I detected a note of cynicism about the corridor
18 concept as a mode of limiting environmental impacts.

19 I wonder if you can tell us anything about the
20 Alaskan experience in terms of that single objective
21 of the corridor concept limiting environmental impacts?

22 A Yes, the point that I
23 was trying to make there is that in achieving a corri-
24 dor, in other words ⁱⁿcoercing a certain transportation
25 mode into a rigidly defined corridor you may be
26 creating worse environmental hazards than those you
27 were trying to avoid, and what has happened in the
28 past is that often those who were promoting corridors
29 as a means of corral~~ling~~ing transportation into one narrow
30 strip or in effect creating situations which were

Weedon & Parker
Cross-Exam by Scott

1 not constructable and all I would say there is that the
2 concept of the corridor should not be used as an
3 excuse for bad engineering. You have to remember the
4 period in which this early concept of corridors occurred,
5 why the philosophy in the north at that time was
6 expressed on your side of the border by the roads to
7 resources programs, and on our side of the border by
8 a less well articulated program, but one very similar.
9 The idea was that we are going to fan out all over
10 the landscape to build roads everywhere, this will
11 unlock our vast untapped resources and everyone will
12 go off into a wealthier and happier future. So the
13 early corridor concepts as brought forward by conser-
14 vationalists were in response to that particular
15 philosophy, and simply stated that if you're going
16 to open up the country, don't build a road up all
17 three valleys, just use the one in the middle and leave
18 the other two untouched .

19 Q Yes, I recognize the
20 historical criticism of the roads to resources approach,
21 which as I understand it was just to put roads everywhere
22 and if you find something at the end to justify the
23 existence of a road, and I understand your criticism
24 of that, but I wonder if you could zero in on whether
25 corridors as you understand them, and your experience
26 with them, have met the other conservationists'
27 objective which is to minimize environmental impact,
28 and before you answer perhaps I could put the proposi-
29 tion to you this way: It is asserted by some that
30 in developing Northwestern Canada there should be a

Weedon & Parker
Cross-Exam by Scott

1 corridor --let's not be too hypothetical -- up the
2 Mackenzie Valley which will have an oil pipeline, a
3 gas pipeline, a railway, a highway, and perhaps a number
4 of other transportation forms, if any are devised,
5 with the idea that these should be isolated in one gen-
6 eral area. Now leaving aside the virtues of that
7 proposal from the point of view of maximizing facilities,
8 what is your experience about that approach in terms of
9 reducing environmental impacts?

10 A I think that if you carry
11 that to extremes you run a grave risk of putting the
12 -- some facilities in the wrong place. I think, you
13 know, that the response to roads to resources program
14 should not be an effort to put everything into the
15 tightest possible straight-jacket. We have to talk
16 about two different types of transportation systems
17 here, those which are designed to serve the population
18 in place, those which are designed to serve resource
19 development. Regarding those, designed to serve
20 resource development, which is what we're about here
21 today, why until you find your resource and then
22 carefully define your market, why you're dealing with
23 somewhat a tabularasa it's almost impossible
24 to make judgmental decisions on.

25 I think the only substitute for
26 that is simply a good planning process which takes into
27 effect existing already developed corridors, and hope-
28 fully reacts to those, if desirable, or if you want to
29 take some of the other approaches which have been ad-
30 vanced, that too much transportation in one place is
bad, why you can react the other way, but at least you

Weedon & Parker
Cross-Exam by Scott

1 should do so from a basis of maximum knowledge. I
2 think corridors, the phrase "corridors", has tended
3 to become a cure-all for just a simple lack of applying
4 good planning practices, and good engineering in
5 situations where industry wanted to do something where
6 the government was not willing to challenge it, and
7 hopefully people tried to then fix the future in place
8 so that government response would be ensured, no matter
9 what. That's the reason why the State of Alaska
10 challenged B.L.M. on their corridor concept, and hope-
11 fully will continue to do so.

12 I have no way of knowing, and
13 I don't think anybody else does, at this particular
14 moment in history whether a Mackenzie Valley corridor
15 is going to serve your needs for the ultimate future
16 better than a Dempster Highway corridor.

Parker, Weedon
Cross-Exam by Scott

Parker, Weedon
Cross-Exam by Scott

1 natural geographic routes, corridors in the sense
2 that we are talking about them here, in the rural
3 context. So what we did achieve there/^{was} we eliminated
4 the necessity to build a haul road from Livengood
5 south of Valdez, however, since this also happened
6 to be the way that Alyeska picked their route anyway,
7 we got into this particular controversy and we did
8 get into it during this in certain selected areas,
9 why -- there were other factors came in which forced
10 us to not observe the corridor complex as you are
11 thinking of it here. An area in which I am thinking
12 of particularly where we had a great deal of
13 controversy was on the Salcha River area which is
14 south of us, a Fairbanks area heavily utilized by
15 recreationists from that city.

16 The Alyeska route as chosen
17 by them diverts from the highway by some six or
18 seven miles and traverses the recreational area at
19 a point at which you might describe is almost
20 maximum impact. The people using this area
21 made a strong presentation that the pipeline should
22 be routed nearer to the highway. After a thorough
23 examination of this possibility it was found that
24 putting it nearer to the highway would simply impact
25 other recreational areas, would not be geotechnically
26 or hydrologically as suitable as the route chosen
27 and would also have severe impact on the Strategic
28 Air Command Base.

29 So, for those reasons we
30 did not observe the corridor concept in its narrowest

confines, in that particular situation.

North of the Yukon, where we were operating on, without these other constraints, the pipeline and the road follow each other except where it would be nonsensical in an engineering sense to have them absolutely parallel. Now, trains, we had another chance to follow the corridor concept in recent years in Alaska when the Fairbanks, Anchorage Highway was built. In this case the highway could have essentially paralleled the railroad tracks or could not have been built at all, but assuming that we are following on the corridor concept of putting everything as close together as possible, the Department of Highways when that decision was made some twelve years ago simply chose to follow the best highway route and in essence ignored the tracks. They are very close together simply because they happened to go through the same mountain pass eventually.

I think that as you get into development on those terms it is going to work out very naturally where you want facilities to parallel each other and where you want them to diverge. I don't think that it is going to be any big problem, as I said before, in getting rid of one concept, which probably didn't make good sense either socially or economically, it is not a good idea to jump all the other way into another one.

Q Well, could I ask you to look at page 7518 of your evidence so that I'll

Parker, Weedon
Cross-Exam by Scott

1 be sure that I understand. The last paragraph, and
2 I am quoting.

3 "Now, the first of these reasons was used by
4 early conservationists and environmentalists
5 in Alaska and elsewhere as a means of defining
6 where surface transportation facilities should
7 be located in order to limit their impact upon
8 the wildlands and wilderness areas . By the
9 designation of corridors it was hoped that
10 a plethora of roads spreading over the
11 landscape could be avoided. Now, this
12 concept is still advocated by some conserva-
13 tionists as a basic tool of land planning
14 But seems to be used less and less as
15 the term 'transportation corridor' becomes
16 more and more associated with the maximized
17 development scenario. The concept has certain
18 validity in that it did limit transportation
19 impacts. However, those who advocated it
20 never did follow through to examine the
21 environmental impacts that would be associated
22 with placing transportation facilities in
23 corridors that were unsuitable for them."

24 I guess what I would really like to know, is have
25 you any judgment about the environmental impacts that
26 the advocates never followed through to examine?

27 A Yes, the impact
28 would be, if you were to follow the corridor concept
29 in its narrowest concept, to where you are taking --
30 where you want to build a road and a pipeline together,

Parker, Weedon
Cross-Exam by Scott

1 and of necessity in order to meet its Grade requirements,
2 the road must somewhat snake up the hills, make
3 switch backs, aim for the lowest points and so
4 forth and where the pipeline can follow an essentially
5 straight route, and this is the situation that exists
6 between the Fairbanks and in the Yukon Valley where
7 the pipeline crosses the Tanana Hills.

8 In that case, if you were to
9 take and follow the road with the pipeline, assuming
10 it is not possible to follow the pipeline with the
11 road, because you wouldn't be able to drive over it,
12 well, you would probably create a great deal of
13 environmental degradation because you would be
14 either putting in your above ground sections or
15 your below ground sections on some long, traverse
16 side hill cuts, instead of stovepiping right up and
17 over the hill and down, which is the easiest way
18 to put in your pipeline.

19 On the other side of it,
20 getting back to the earlier example of the Fairbanks-
21 Anchorage Highway and the railroad. If you were to
22 follow the railroad with a highway, and follow it
23 rather narrowly, why you would probably be creating
24 some very bad problems with river crossings, erosional
25 control and so forth that were avoided by taking
26 a separate routes. I am not sure how carefully this
27 was considered, but knowing some sections that the
28 railroad traverses and knowing the impossibility of
29 following them with a highway, what I am saying is that
30 if you followed the railroad exactly you'd have had to

Parker, Weedon
Cross-Exam by Scott

1 blow away half of a mountainside in some places.
2 in order to put your highway in, and that, you know,
3 is what happens to your corridor concept, is that
4 geography interferes in the same way in which in
5 an urban concept, why society interferes and
6 keeps planners from following through with their
7 grandest designs.

Weedon & Parker
Cross-Exam by Scott

1 Q We are always, you and I are
2 always going to beat each other with an extreme case but lets see if I
3 can have one more crack at this. I take it that everybody
4 recognizes that you don't simply anywhere select a
5 corridor and jam everything into it, because it's a
6 corridor. There's no magic in that, is there?

7 A No, I guess that's the
8 problem, not everybody did recognize it.

9 Q All right, it's recognized
10 between you and me at least at the moment. Would it be
11 fair to say that what you do therefore is you take
12 your transportation requirements, whether it be rail
13 road, oil or gas pipeline, and first of all put them
14 where they best should be, recognizing that as you
15 build one, the maximization of resources and facilities
16 will probably make it desirable to put it near the
17 existing one?

18 A Sure, providing you need
19 the facility in that particular location.

20 Q Right.

21 A No problem, we're not
22 that far apart, projects have always tended to
23 maximize their costs by piggybacking on other projects,
24 where possible. It all depends on what you want to
25 do, really. German railways were built for different
26 reasons than American or Canadian railways, and tend to
27 follow different patterns, and certainly have affected
28 the development of modern Germany, the same way as our
29 railways affected our development.

30 To go back and I'll say we

Weedon & Parker
Cross-Exam by Scott

1 would have done it differently is, you know, it over-
2 looks the particular moment in history in which those
3 railways were developed. In the same way we built our
4 highways and tended to follow railroad corridors for
5 geographical reasons, and also because that was the
6 cheapest way to get equipment out to the highway site
7 in the early years. Also the right-of-ways were
8 there.

9 Q So I can't get you to go
10 back on the Alaskan experience and tell us whether on
11 environmental terms corridors have met the objectives
12 that in part led to their development?

13 A I think the reason why is
14 that we have never in the state used four corridors
15 as a formal planning concept. We have dealt with the
16 rights-of-ways of various projects as they came alone.
17 Sometimes well, sometimes badly, but as I've tried to
18 illustrate with the various projects that were developed
19 in Alaska, the concept of putting everything into one
20 particular corridor was only advanced at one time in
21 history, and that was where the North Commission, which
22 was created by Governor Hickle at that time, was
23 created to develop a system of railways to the
24 Arctic Ocean and through Western Alaska. They did
25 they did many studies and eventually \$3 million of federal
26 and state money was spent on a study of railroads and
27 roads through the north and to the western areas.
28 This study did the normal limited amount of soil testing
29 and other things you would determine as to whether a
30 railroad could be built and the railroad because of Governor

Weedon & Parker
Cross-Exam by Scott

1 Hickle's predilection was a first priority. Railroad
2 was routed to the 'Arctic up the, from the Nennana
3 to Tanana, to the area of Alatna where it split,
4 part going westward into Kobuk', the other part going
5 up the Koyukak River to the north fork of the
6 Koyukak up the north fork of the Koyukak
7 and through the Brooks Range, coming out on the north
8 side of the Brooks Range and then generally heading
9 for Prudhoe Bay. The reason for this long digression
10 is simply to point out that this is not the route that
11 was taken by the pipeline or the road. So our very
12 first effort at corridor planning even though we spent
13 \$3 million on it, did not result in the actual facilities
14 following that particular corridor. The reason why
15 was because that corridor was not the most suitable
16 one for a pipeline, and the road of course was built to
17 follow the pipeline.

18 THE COMMISSIONER: Has the
19 railway been built?

20 A Oh no. No, there has
21 been no extension of the Alaska Railway.

22 Q It goes as far as Fairbanks,
23 doesn't it?

24 A Yes. That happened in
25 1919.

26 MR. SCOTT: Thank you, those
27 are all the questions I have. Thank you, Dr. Weedon
28 and Commissioner Parker.

29 THE COMMISSIONER: Re-examination?
30

Weedon & Parker

1 MR. ANTHONY: No re-examination.

2 THE COMMISSIONER: Well,
3 thank you very much, Commissioner Parker and Dr. Weedon.
4 We certainly are in your debt for coming and giving
5 us the benefit of your wide knowledge and experience
6 in these matters. I hope you'll convey the thanks
7 of the Inquiry to the Governor for allowing you to
8 come as a matter of good neighborliness. I really have
9 appreciated it and thank you very much.

10 WITNESS WEEDON: We really
11 enjoyed our time here very much, and I would say that
12 if the Inquiry as a whole or in part ever wishes to
13 visit Alaska in the future, I'd certainly be glad and
14 I know Commissioner Parker would, to help pave the way -
15 no, I shouldn't use those road terminologies -- help
16 make it possible for you to have a good visit.

17 MR. SCOTT: We may pay for
18 that expression of "goodwill", sooner than you expect,
19 Dr. Weedon.

20 WITNESS PARKER: Thank you,
21 Commissioner, and it's certainly not been one way. We
22 have learned a great deal from this experience and we
23 will certainly carry back a good deal of benefit to
24 the state from it.

25 THE COMMISSIONER: Well, thank
26 you very much. I think we'll adjourn for coffee and
27 invite our guests to join us, and then we'll start
28 again in a few minutes.

29 (WITNESSES ASIDE)

30 (PROCEEDINGS ADJOURNED FOR FEW MINUTES)

1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 THE COMMISSIONER: Well, we
3 will come to order then.

4 MR. SCOTT: Mr. Commissioner,
5 Dr. Owen Hughes gave evidence at Whitehorse on
6 August the 15th, volume 55. He was on a panel
7 that CARC called with himself and Dr. Morlan. Dr.
8 Morlan I think is in the Soviet Union, or away. Dr.
9 Hughes was recalled for cross-examination at my
10 request. It may be that other counsel have questions
11 of him, I don't know. He has already been sworn.
12 Mr. Marshall, have you --

13 MR. MARSHALL: I think we
14 start with --

15 MR. SCOTT: Oh, I am sorry.

16 MR. MARSHALL: -- Mr. --

17 MR. BELL: I have no
18 questions, sir.

19 I believe Mr. Bayly --

20 MR. SCOTT: Mr. Bayly told
21 me had none.

22 MR. HOLLINGWORTH: I have
23 none.

24 MR. MARSHALL: I now have
25 one.

26 MR. SCOTT: I saw from the
27 look of your back bench there you might have one
28 at least.

29 MR. MARSHALL: We are here
30

1 to listen to your piercing cross-examination, Mr.
2 Scott.

3 OWEN L. HUGHES, Resumed

4 CROSS-EXAMINATION BY MR. MARSHALL:

5 Q Dr. Hughes, you mentioned
6 in your transcript at 7417 that north of 68'30"
7 thermokarst depressions are larger and deeper than
8 they are south of that. You also allude to potential
9 for frost heave in these depressions. Sir, would
10 frost heave be no problem if the sediments in these
11 depressions were already frozen?

12 A Well, that is quite
13 true. I acknowledge that the further north you
14 get the greater the probability that the bottoms
15 of these thermokarst depressions will have frozen
16 back, if you want to use a placer miner's term, but
17 they still present some very significant problems
18 of slope stability on the walls of the thermokarst
19 depressions. That was the point that I was making
20 there, really, that because of the greater depth,
21 there were higher and steeper walls.

22 MR. MARSHALL: I have no
23 further questions, Dr. Hughes.

24 CROSS-EXAM BY MR. SCOTT:

25 Q It is interesting, Dr.
26 Hughes, that your two old pupils can only think of
27 one question to ask.

28 Dr. Hughes, when you gave
29 evidence at Whitehorse, I understand from reading
30 the transcript, you compared the distribution of

O.L. Hughes
Cross-Exam by Scott

1 sensitive soil or terrain types for each of the
2 various alternative routes and in the course of
3 doing that you made reference to the differing
4 permafrost conditions on similar soils and terrain
5 as found on each of those different routes, is that
6 what you were attempting to do at Whitehorse?

7 A Yes, in part, mm-hmm.

8 Q Now, I think one of the
9 comments that you made was to compare the limited
10 occurrence of permafrost in the glacial lake silts
11 in the southwest Yukon Valley, that is, on the
12 Fairbanks Corridor on the one hand --

13 A Right.

14 Q -- with the substantial
15 occurrence of permafrost in similar deposits in the
16 Mackenzie Valley --

17 A Right.

18 Q -- and I take it that
19 that difference was one of the principle thrusts
20 of your comparison of the two corridors?

21 A Yes.

22 Q -- and that that difference
23 occurred with respect to distribution of permafrost
24 even though the two points were roughly at the same
25 latitude.

26 A Mm-hmm.

27 Q Now, have you got a copy
28 of the Permafrost Map of Canada?

29 A I just happen to have one,
30 yes.

1 Q Luck, luck. First of all,
2 I would like, Mr. Commissioner, if the Permafrost
3 Map of Canada could be made an exhibit in the Inquiry
4 and be given the next exhibit number and I wonder,
5 Dr. Hughes, with reference to that permafrost map,
6 if you could draw the line on the map behind you which
7 shows the substantial permafrost line. Now, you will
8 find that easy on the map behind you because it is
9 already etched in red, but if you could perhaps
10 just exhibit it to the Commission so we could see
11 how these routes differ.

12 (PERMAFROST MAP OF CANADA MARKED EXHIBIT 289)

13 A Well, the line I
14 referred to --

15 THE COMMISSIONER: Just a
16 second, could you show me what it is we are concerned
17 with here?

18 A Well, we are looking
19 at the Permafrost Map of Canada which has three
20 main zones in it. A zone north of this heavy green
21 line which is the zone of more or less continuous
22 permafrost, then a zone in the middle which is a zone
23 of widespread discontinuous permafrost.

24 MR. SCOTT: And you are
25 indicating the area between the dark green line, north
26 of Great Bear Lake, and the orange line that runs
27 through --

28 A Just a little south of
29 Fort Simpson -- well no, just a little south of
30 Fort Simpson.

O.L. Hughes
Cross-Exam by Scott

1 MR. ANTHONY: Mr. Commissioner,
2 I think the court reporters are not able to follow
3 the questions. I was wondering so that the record
4 is complete if Mr. Scott could perhaps use a mike.

5 MR. SCOTT: Have the
6 reporters got the line that Dr. Hughes referred to
7 first which is the -- well, as I understand it, Doctor,
8 the line that denotes the area of permanent permafrost

9 A Of continuous permafrost,
10 the southern limit of continuous permafrost and then
11 another line which denotes the southern limit of
12 widespread discontinuous permafrost and then south of
13 that is another zone of what is sometimes called
14 sporadic permafrost, but discontinuous permafrost,
15 but largely scatterd.

O.L. Hughes
Cross-Exam by Scott

1 Q And so that the Commis-
2 sion will understand how to use that map, the first
3 line that you've referred to, of continuous permafrost,
4 runs roughly north of Great Bear Lake, the second line
5 of discontinuous permafrost runs roughly through the
6 Fort Simpson area.

7 A Right.

8 Q And the third line of
9 sporadic permafrost runs where, through what contact
10 point?

11 A A little south of Fort
12 Vermilion, Alberta. By the time you get down there
13 you'll have to look very hard to find --

14 THE COMMISSIONER: Do you agree
15 with the characterizations, sporadic permafrost?

16 A Wide-spread discontinuous
17 permafrost. The term "sporadic" permafrost has been
18 suggesting that there's very much, in an area there's
19 very much less permafrost than there is unfrozen ground.
20 Once you get south of that line that passes through
21 Fort Simpson.

22 THE COMMISSIONER: Mr.
23 Hollingworth, you wanted to --

24 MR. HOLLINGWORTH: Excuse me,
25 Mr. Commissioner, it seems to me the lines you were
26 speaking of go up and down, Mr. Scott, referring to points
27 on the map as if the lines run accross the same way as
28 lines of latitude do--

29 MR. SCOTT: No, that wasn't
30 my intention, Mr. Commissioner. That's simply so you
can identify it by looking at the map, which of the

O.L. Hughes
Cross-Exam by Scott

1 lines was referred to.

2 THE COMMISSIONER: In the
3 Mackenzie Valley we know where the lines cross.

4 A But the point I made
5 in Whitehorse was that that a peculiar northward
6 kink in the red line, which is the one that is the
7 southern limit of widespread discontinuous permafrost,
8 which then left major parts of this routing in the
9 Yukon south, of any major problems with permafrost.

10
11 Q Where is the 60th
12 Parallel on that map? Where's Whitehorse, just so
13 we don't lose ourselves totally here?

14 MR. SCOTT: It's here somewhere.

15 THE COMMISSIONER: Right, and
16 that line that goes north there is the line that goes
17 through Simpson and above it lies the zone of dis-
18 continuous permafrost, is that right?

19 A Yes, widespread discontinuous
20 permafrost.

21 Q So --

22 A It takes quite a marked
23 sweep northward.

24 Q Well, now, tell me so
25 that we can relate that to the alternate route, if
26 this pipeline route, the Yukon route, it would take,
27 that route would take the greatest advantage of the
28 line that sweeps north that you've described, but
29 there is no advantage on the Fairbanks route.

30 A Well, there is an advantage
for the Fairbanks route as well if you take into

O.L. Hughes
Cross-Exam by Scott

1 consideration, if you're assuming the necessity for
2 a "y" from the Mackenzie Delta.

3 Q The Dempster. That "Y",
4 that line that you've described almost reaches
5 Dawson, does it?

6 A Yes, Dawson is here.

7 Q So that the supply leg
8 from the delta would just south of Dawson encounter
9 this sporadic permafrost, leaving the zone of discon-
10 tinuous permafrost and there's an advantage to be
11 gained there.

12 A I made that point
13 particularly with reference to the main occurrence of
14 glacial lake silt in the Yukon which is a belt from along
15 the Dezadeash-Takhini Valley
16 from Whitehorse almost to Kluane Lake.

17 Q Would you repeat that
18 again, just so it's on the record? There's something
19 or other valley and there's something or other lake.
20 Would you repeat that, please?

21 A The significant problem
22 you know, at least one of the problem types of this
23 terrain is the glacial lake sediments when they are ice
24 rich. The only really extensive occurrence in the Yukon
25 of these sediments anywhere near the pipeline route is
26 right along the Takhini-Dezadeash Valley between White-
27 horse and Kluane Lake roughly.

O.L. Hughes
Cross-Exam by Scott

1 Q And that is along the
2 route to the Fairbanks corridor for perhaps 100 miles
3 west of Whitehorse?

4 A Yes, just about. Now
5 the point of looking at the distribution of permafrost
6 is that that one major occurrence of glacial lake
7 silt in the Yukon is south of the widespread permafrost.
8 Now it's possible that there is sporadic permafrost
9 there but highway construction and so forth, but we
10 so far haven't encountered difficulties with permafrost.

11 Q So that it is not the
12 problem it would be if it lay north of that line.
13 That's the picture, I take it?

14 A That's right.

15 MR. SCOTT: Dr. Hughes, could
16 I just summarize to see if I understand? If the area
17 of continuous permafrost be regarded as an area that
18 is troublesome, abundant permafrost in an area that
19 is regarded as troublesome, I take it that the line
20 that separates the areas on the Mackenzie Valley route
21 runs roughly at Fort Simpson.

22 A Right.

23 Q The line on the Fort
24 Yukon route which you have shown on the map behind
25 you takes advantage of the substantial kink or bulge
26 in the line to the north.

27 A Yes, that was the main
28 point.

29 Q Yes, and the third point
30 is that on the Fairbanks route, even though the line

O.L. Hughes
Cross-Exam by Scott

1 dips down, there is very little south of the line --
2 I'm sorry, north of the line in Canada.

3 A Right. I haven't scaled
4 off the actual distance.

5 Q Yes. Now, Dr. Hughes,
6 if I could come to another matter, on page 7430 of
7 the transcript at Whitehorse in answering Mr. Anthony's
8 questions about terrain mapping, you said at line 6:

9 "It is not enough, however, to divide the
10 terrain into a number of terrain types.

11 Each terrain type should be characterized."

12 Now first of all, you're familiar with the terrain
13 typing that has been done by Dr. Mollard and Mr. Gilles-
14 pie in general terms, are you?

15 A Right. Yes.

16 Q I'm sorry, it was Mr.
17 Drew, I'm sorry. You're familiar with Foothills
18 terrain typing.

19 A Not as familiar as I
20 am with the - - that done by Dr. Mollard, but I have
21 looked at it, yes.

22 Q Yes.

23 THE COMMISSIONER: There's
24 a certain amount of overlap anyway.

25 M R. SCOTT: And you go on
26 to say at 7430 that:

27 "It is not enough, however, to divide the
28 terrain into a number of types. Each type
29 should be characterized."

30 Now, I wonder if you could be good enough to describe

O.L. Hughes
Cross-Exam by Scott

1 in greater detail the difference between terrain type
2 mapping and terrain type characterization?
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O.L. Hughes
Cross-Exam by Scott

1 A Well, terrain typing is
2 a classification and you can divide terrain into
3 classes knowing very little about the terrain that
4 makes up each class other than its appearance on
5 an air photo. Now, I am not suggesting that the
6 terrain typing by Dr. Mollard or Mr. Drew is that
7 limited, but you have -- in my opinion, -- you
8 have to go beyond a clasification and onto what I would
9 call terrain characterization and by that I mean getting
10 a full three dimensional picture of each terrain
11 class and a thorough understanding of the natural, or
12 for that matter, man induced processes that go on
13 within that terrain type.

14 Q Well, does terrain
15 characterization then go beyond a detailed list of
16 the composition of the soil to something else?

17 A Yes, it is getting --
18 in the Mackenzie Valley Pipeline Assessment on page
19 185, there is a list of some of the factors involved in
20 this characterization and really it is not only
21 examining those factors, but sort of getting the
22 whole thing together by looking at a three dimensional
23 sample of the terrain unit at field scale. By that
24 I mean perhaps something in the order of a kilometer
25 square and as many feet deep as may be necessary
26 depending on the proposed use of the terrain.

27 Q Now, on Dr. Mollard's
28 maps, for example, I note from my own examination,
29 that one of his terrain types is MRD which means
30 Mackenzie River Delta and is virtually all the land in

1 the Delta. Another of his terrain types is SB which
2 means "speckled bog". What in your judgment is
3 required in order, let's take speckled bog as an
4 example, to go beyond the terrain typing and to
5 characterize the terrain in the SB designation.

6 A Well, I think that
7 SB is one of the better examples that I could take
8 particularly because it is widespread and it is
9 widespread in the -- down to the Alberta border in
10 that zone where there is going to be a question
11 of where the optimum point is for the change over
12 from a chilled line to a hot line. We know
13 from the information that Dr. Mollard and others
14 have given us, from work of the Geological Survey,
15 most of it from ground / ^{observation} but some of it from drilling,
16 we know roughly what this unit consists of. Maybe
17 I shouldn't even bother describing it. I understand
18 that there has been considerable discussion of this
19 particular terrain unit, but just briefly it consists
20 of elevated , flat peat areas alternating with ponds
21 and wet depressions and those ponds and wet depressions
22 connected by sinuous depressions and movement
23 of, slow movement of water through the system. Limited
24 drilling indicates that the elevated areas are
25 frozen, peat one to three, sometimes exceptionally
26 four meters thick. Peat overlies clay silt usually
27 with quite high ice content, the ice occurring as
28 layers anywhere from a centimeter to a meter thick.

29 In the depressions, some very limited, even
30 more limited drilling and some hand probing indicates

O.L. Hughes
Cross-Exam by Scott

1 that the materials in the floors of the depressions
2 and under the pond is unfrozen, water saturated.
3 We know if there is local ice collapsing on pond
4 margins, this is due to melting of the ground ice
5 in the silt beneath the peat. We know also there is
6 local aggradation of permafrost to produce low
7 peat domes, sometimes called palsa. This is a product
8 of permafrost aggradation with ice segregation and
9 what is called frost heave.

10 We have got very little
11 knowledge of the factors that trigger this collapsing,
12 we don't know very much about the factors that condition
13 the permafrost, the local aggradation. We don't have
14 even such simple information as -- let's suppose
15 you were to run a straight line across these thermokarst
16 peat lands. What would be the typical spans of
17 frozen versus unfrozen material that you would get as
18 you cross it? To my knowledge, nobody's run a trial
19 line of a kilometer or so to find out this sort of
20 thing. Nobody has measured the flow of -- the movement
21 of water through the system. I think it is partly in
22 near surface seepage and probably some in subsurface
23 seepage, but this hasn't been confirmed.

24 Q Do I understand correctly
25 then that when we come to a designation on a terrain
26 map like "speckled bog", that we may know something
27 from that about the general soil composition that is
28 found in that designation?

29 A Yes, that is right, but
30 I --

O.L. Hughes
Cross-Exam by Scott

1 Q Is that enough or do
2 we need to know more?

3 A Well, I am not a pipeline
4 engineer, but I am a geological engineer and if I
5 were asked to help to design a pipeline across a
6 number of terrain types, I would want to have the
7 in depth terrain characterization so that I knew
8 what made the thing tick.

9 There is what you might
10 call static composition of the thing, the distribution
11 of permafrost, the amount and distribution of
12 ground ice, the type of soil, material and its
13 variability, but there are also the geomorphic
14 processes, if you will, these are changes that are
15 going on naturally, or perhaps man induced. I would
16 feel that this was essential to even to begin to think
17 of how I would design.

18 Q And do I understand correctly
19 that that process of characterizing an existing
20 terrain type involves the selection essentially of a
21 cube of territory which you probe in depth, not only
22 from the point of view of soil composition, but from
23 the point of view of physical processes?

24 A That is right, yes.
25 I hesitate to say a cube. Let's say a thick slab,
26 because I don't want to -- I suggested that perhaps
27 a kilometer square might be -- give or take a bit --
28 might be reasonable and I am not going to suggest that
29 people drill a kilometer deep.

30 Q When you were trying to

O.L. Hughes
Cross-Exam by Scott

1 explain this to me, one of the more difficult exercises
2 that you have been subjected to, I am sure, in many
3 years, you compared the way you would do this with
4 the way that you would analyse the shipment of
5 a hundred fruitcakes. I think you said that what
6 you would do is you wouldn't put a probe in every one
7 of the hundred. You would take one out of the hundred
8 which was typical and take it apart in order to
9 analyse precisely not only what was there but how
10 it worked.

11 A Yes, and that is
12 essentially the way we put it, yes.

13 Q And is that what terrain
14 characterization beyond terrain typing means?

15 A Yes, that is what I
16 am trying to get at. I am not suggesting that this has
17 to be done in great detail every mile along the
18 route. I am suggesting taking a very restricted
19 area and depth and using that -- selecting it carefully
20 so that it represents the same range of variability
21 that you find within that terrain unit throughout the
22 area of interest, but it is just to give you that feel
23 for the thing as a unit rather than looking at
24 drainage problems here and slope stability problems
25 there, but looking at the physical composition and
26 the physical processes within that kind of terrain
27 and seeing what problems it presents to you.
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O.L. Hughes
Cross-Exam by Scott

1 Q In analyzing this
2 particular fruit cake which you have selected, apart
3 from soil composition within it, what other things
4 would you test or probe or try to find out? Could you
5 just listed some of the things for us.

6 A Well, I have mentioned
7 that it's essentially what is in the Mackenzie Valley
8 Pipeline assessment, things like the typical land
9 form, because it's the incidence of slopes and intensity
10 of slopes and so forth. This is part of the problem,
11 this is something you have to know to assess the
12 problems of surface erosion. The typical character
13 and the range of variation of geologic materials or
14 soils by a soils engineer, and for some terrain classes
15 you might have a layered -- maybe the fruit cake example
16 breaks down here because you can have layer cakes
17 too, and you have to look at individual layers. But
18 I'd certainly want to know the typical distribution
19 and thickness of permafrost and typical form and
20 distribution and amount of ground ice, and the typical
21 patterns and variations of both sub-surface and
22 surface drainage, and then the physical processes which we
23 talked about, whether they're man-induced ones. Man-
24 induced ones are particularly useful to look at, but
25 the natural ones are instructive too.

26 Q Well now --

27 A You know, including slope
28 failure, erosion, all of these processes, and I think
29 I'd add vegetation onto that list.

30 MR. MARSHALL: Mr. Commissioner,

O.L. Hughes
Cross-Exam by Scott

1 Mr. Scott's been good enough to adhere to the rules in
2 providing us with a synopsis of prepared direct evidence
3 of his witnesses. I wonder if he's in a position to
4 provide us with a synopsis of the prepared cross-
5 examination of this witness? I have noticed a remark-
6 able dove-tailing of questions and answers.

7 MR. SCOTT: Well, I've gone to
8 some trouble to prepare my case.

9 MR. HOLLINGWORTH : Mr. Scott
10 has even conceded that he's been briefed or has briefed
11 with the witness at this point, Mr. Commissioner, and
12 I regard it as somewhat improper to cross-examine a
13 witness on this basis. There's no property of
14 witnesses, so why couldn't he have called this witness
15 and produce his examination in chief and give it to us
16 according to the rules of the Commission two weeks
17 in advance?

18 MR. SCOTT: Well now --

19 MR. MARSHALL: This really
20 is evidence in chief, I submit, sir.

21 MR. ANTHONY: Mr. Commissioner
22 if I may be permitted, since I believe it all started as our
23 witness,
24 from our point of view we asked Dr. Hughes to appear
25 and we went to some considerable length to prepare his
26 evidence and make it available to the participants.

27 I have no objection to anybody advising the
28 witnesses that they are going to want to proceed with
29 cross-examination and ensure that they are instructed
30 on the sorts of questions to be asked so that they can
prepare themselves, especially when we have a long gap.

O.L. Hughes
Cross-Exam by Scott

1 I think that there is nothing wrong for anyone to
2 approach a witness and say, "I'm going to be asking
3 these questions. " I have no objection in this particular
4 case and I think that it would be setting an improper
5 precedent if we demanded that in each case you couldn't
6 talk to the witness and have him prepare for the cross-
7 examination.

8 THE COMMISSIONER: The rule
9 is that the counsel calling the witness are expected
10 not to discuss his evidence with him once he is
11 under cross-examination. These rules have a limited
12 application here because this isn't a trial. We're all
13 trying to get to the truth in the sense of the most
14 accurate prediction of what will occur when a pipeline
15 is built. The point that you did make that -- and
16 you made, Mr. Marshall -- I think has some bearing
17 perhaps on the thing is that Dr. Hughes was a member
18 of the Assessment Group, and technically Mr. Scott is
19 entitled to proceed in this way. I think the way
20 to handle it is to let him go on and make the point he
21 wishes to, whatever it is, and I don't think there's
22 any problem of putting words in a witness' mouth when
23 you have someone such as Dr. Hughes, who, it's not as
24 if he were someone who was overawed by this whole
25 experience and thought he had to agree with everything
26 Mr. Scott said, or suffer some horrible fate. So
27 I think we'll let Mr. Scott proceed, and if the rest
28 of you want to have a bash at it, you can. ^{If} /You're not
29 in a position to cross-examine at this stage further,
30 to cross-examine further, we'll have to cope with that.

1 MR. SCOTT: I'd just like to
2 make one other observation, and it's this, that Dr.
3 Hughes is needless to say a government employee, and
4 we've gone to some lengths to assure that any person
5 who wishes to interview a government employee before,
6 during or after his examination as a witness here
7 should be given every opportunity that we can arrange
8 to do so. If my friends have any difficulty inter-
9 viewing any government employee, either before he's
10 called as a witness, during the period of time he's
11 called as a witness, or afterwards, if they bring
12 that to my attention I will do everything I can to
13 see that it doesn't occur. My friends may feel that
14 they have some property in their experts which prevents
15 us from interviewing them, but that is not to be true
16 of government employees, and if there is any difficulty
17 about government employees in the future, I'd be glad
18 to know. I'm prepared to take advantage of that
19 position as well as anybody else.

20 MR. MARSHALL: Mr. Scott, we
21 appreciate that and sir, I'm quite content with the
22 ruling. The point was simply this, I thought that
23 in order to expedite things, the idea was that if
24 somebody was going to give direct evidence, we should
25 know about it in advance so we can be briefed and be
26 ready. Now I don't understand what Dr. Hughes has been
27 saying this last while. It seems to me it's in the
28 nature of direct evidence on this new --

29 MR. SCOTT: Well, just so there
30 will be no doubt --

O.L. Hughes
Cross-Exam by Scott

1 MR. MARSHALL: Well, I don't
2 know whether I'll have to cross-examine or not.

3 MR. SCOTT: I intend to refer
4 Dr. Hughes to two portions of evidence, one given by
5 Mr. Gillespie as to the use to be made of terrain typing,
6 and one given by Dr. Clark and to ask for his comments,
7 if any, on that. The third thing I propose to do is
8 to ask him whether it is possible to establish a
9 mode or a technique by which the place at which chilling
10 terminates can be determined. Mr. Commissioner --

11 THE COMMISSIONER: Ought to
12 terminate or terminates.

13 MR. SCOTT: Where chilling
14 terminates. The difficulty we have here is that
15 Arctic Gas has decided to terminate chilling at the
16 Alberta border, a convenient and geographically neat
17 location. Foothills has decided to terminate chilling
18 at Fort Simpson, and their reasons aren't given
19 anywhere for that determination. Dr. Adam has developed
20 a formula for the Environmental Protection Board which
21 has to do with the slumpage over, averaged out over
22 a period of space, and I propose thirdly to ask Dr.
23 Hughes what he would do if he were invited to decide
24 where chilling should stop.

25 THE COMMISSIONER: By the way
26 Dr. Adam said chilling should terminate at --

27 MR. SCOTT: Willowlake
28 River.

29 THE COMMISSIONER: -- Willow-
30 lake River.

O.L. Hughes
Cross-Exam by Scott

1 MR. SCOTT: And he presented,
2 as I recall it, a formula in which he measured acceptable
3 degradation at two feet over 5% of the section. That
4 was his formula and he applied it. Now I simply thirdly
5 propose to ask Dr. Hughes what he would do if that
6 were in issue.

7 THE COMMISSIONER: Well, I
8 would like to know what he would do.

9 MR. HOLLINGWORTH: Well, I'd
10 like to know too, but my objection is that this -- and
11 I too, am quite content with your ruling,
12 it's just that this really is in the nature of direct
13 evidence and it's my submission that we ought to have
14 had advance warning of this so that I could either have
15 an advisor here, so that I could then be in a position
16 to cross-examine Dr. Hughes, or I could be in a position
17 to lead rebuttal evidence immediately following his
18 testimony. Now I am in the position to do neither, and
19 this will stand on the record I don't know what's coming,
20 this will stand on the record for some considerable
21 period of time.

22 THE COMMISSIONER: Well, a
23 lot of things are going to be standing on the record
24 for some considerable period of time, and people will
25 have an opportunity later on to catch up with them.

26 This is really the first occasion in Canada when
27 we've tried to carry out an Inquiry like this and you
28 run into these things. I just think it would be
29 an unhappy result if we brought Dr. Hughes up all of
30 this way. Frost heave is very much in the minds of all

O.L. Hughes
Cross-Exam by Scott

1 of us, chilling, where you want to terminate chilling
2 and so forth, and if we have someone here who can
3 shed some light on the subject, I think he ought to,
4 subject to your right to cross-examine, subject to
5 Mr. Marshall's right, subject to the right to call
6 further rebuttal. I made it clear last week that
7 the ordinary rules about evidence in chief, evidence
8 in answer and evidence in rebuttal, would likely be
9 very difficult to observe on the subject of frost
10 heave. I suggested we would be hearing evidence
11 in reply to evidence in reply to evidence in reply to
12 what somebody else said last May. That's the way things
13 are turning out, and I think you will just have to
14 live with this, Mr. Hollingworth, because we've got
15 to proceed. If anybody comes in here and has anything
16 to say that is worthwhile, and is likely to be useful
17 to the Inquiry, I have to let it in and then as best
18 I can, guarantee that everyone has the right to challenge
19 it. But in the nature of this Inquiry, where we are
20 trying to predict in the public interest what is
21 likely to occur, years from now, we have to take
22 advantage of the evidence of anyone who can help us.

23 It is not like a Court case where you may very
24 well say, as the presiding officer, the judge might
25 very well say, "No, I'm not going to hear this. It
26 is something that I just can't allow under the
27 circumstances."

28
29 There you're trying to re-
30 construct what has occurred in the past. Here we are

O.L. Hughes
Cross-Exam by Scott

1 trying to predict what is likely to occur in the
2 future and it's a different kind of task, in my view.
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1 MR. MARSHALL: Sir, with
2 respect, I don't really think that -- certainly
3 that is not my concern.

4 MR. HOLLINGWORTH: No, it
5 is not my concern.

6 MR. MARSHALL: I am quite
7 happy about this --

8 MR. SCOTT: Well, Mr. Com-
9 missioner, may --

10 THE COMMISSIONER: Well,
11 let Mr. Marshall and Mr. Hollingworth have their --

12 MR. MARSHALL: I think the
13 point is this, with all due respect to my learned
14 friend, this is a set up, and Dr. Hughes is on the staff
15 of the Assessment Group. Now, if it is direct evidence
16 let's call it direct evidence. If it is cross-
17 examine, cross-examination, let's call it cross-
18 examination.

19 My only point here is in the
20 kind of a guise of cross-examination we are getting
21 direct evidence. You have said you worked out the
22 questions and answers beforehand. Well, if that is
23 what it is, -- fine --

24 MR. SCOTT: No, no, no, I
25 didn't say that. That is offensive. I don't accept
26 that as a characterization of what has been done at
27 all and I think it is quite wrong. What happened is
28 that when Mr. Anthony called Dr. Hughes at Whitehorse
29 he elicited from him the distinction between terrain
30 typing and terrain characterization. He elicited that

1 evidence, I didn't, and that paragraph I read in
2 opening, I had substantially asked and had the
3 advantage of his views in the interim -- seems to me
4 there is nothing wrong with that, I have substantially
5 asked Dr. Hughes to spell out the difference that
6 he explicitly stated in replying to Mr. Anthony's
7 question. Now, that is what cross-examination is all
8 about. The fact that I have had the advantage of
9 interviewing Dr. Hughes is an advantage which is
10 available to anybody, is entirely beside the point. I
11 will be calling in other phases, experts who were
12 retained by Arctic Gas and who are no longer retained
13 by them and I won't be surprised if Mr. Marshall takes
14 the opportunity to interview them before he cross-
15 examines them. I would be surprised indeed, if he
16 didn't. I don't see anything wrong with that and
17 to suggest that two professional persons are engaged
18 in a setup is, I presume, a rhetorical effect and
19 nothing more.

20 MR. MARSHALL: Well, I with-
21 draw that, Mr. Scott. I am quite happy to proceed,
22 sir.

23 THE COMMISSIONER: Well, no,
24 but Mr. Scott, to be fair, so far it is hard to object
25 to what you are doing, but I thought the argument
26 was about you're now turning to our favourite subject,
27 i.e. frost heave, and asking Dr. Hughes to tell us
28 where he would terminate chilling, a subject you
29 didn't discuss in Whitehorse.

30 MR. SCOTT: That is true, Mr.

1 Comissioner --

2 THE COMMISSIONER: And in that
3 repsect I think that Mr. Hollingworth and Mr. Marshall
4 have a point. I indicated that I was disposed to
5 hear the evidence in chief now because, however, you
6 elicit it it is something that they would be entitled
7 to canvass further themselves, disposing of all of
8 this argument about how you characterize the evidence,
9 and that is where we are, it seems to me.

10 MR. SCOTT: Well, then, I
11 presume that I can pursue this line, just as I could
12 in the case of cross-examining any witness who
13 gives evidence.

14 MR. HOLLINGWORTH: may I just
15 make it perfectly clear, sir, that in response to
16 you I am not objecting in any way to this evidence
17 going in, just the method^{by}/which it is going in that
18 I object to.

19 THE COMMISSIONER: Well,
20 in a sense what you are saying is that it is an
21 entirely new subject and given my rulings, you should
22 have had some kind of notice that the matter would
23 be raised. I thought in the past we had bent
24 the rules a little bit for Foothills on terms of
25 giving notice of evidence and I was just going to
26 bend them for Mr. Scott on this occasion. Dr. Hughes
27 is here, it is only 4:15, I would like to hear what
28 he has got to say.

29 MR. SCOTT: I can only
30 make one observation, the cross-examination has always

O.L. Hughes
Cross-Exam by Scott

1 bent to the purpose of the cross-examiner, and this
2 morning, sir, we heard cross-examination on the
3 land claims question which it doesn't seem to me
4 had anything to do with alternative corridors, but
5 be that as it may.

6 Q Dr. Hughes, I want to
7 refer you first of all on the subject of terrain
8 typing and terrain classification, raised by Mr.
9 Anthony at Whitehorse to the evidence given by Mr.
10 Gillespie at page 8562 and 8563 in which he says --
11 well, the question asked by me is this:

12 "Well, let me ask you this. Are you
13 going to do a subdivision of Mr. Drew's
14 map that shows the soils located from place
15 to place along the route?"

16 And Mr. Drew's map was the terrain typing map.

17 Answer:

18 "No, I think that as Mr. Drew says, the
19 terrain typing is really for reconnaissance
20 and I think as soon as we have a line pretty
21 well established we will be doing drilling
22 in these various areas really to confirm
23 terrain types or to confirm soil conditions
24 and we are more interested from a geotechnical
25 point of view in soil conditions rather than
26 terrain types. We cannot design a pipeline and
27 a facility or do a stability analysis on terrain
28 typing. We have to have the detailed informa-
29 tion available which can only come from
30 drilling.

O.L.: Hughes,
Cross-Exam by Scott

1 And one other passage in the evidence of Dr. Clark
2 at page 3516, the question:

3 "Well, now, in the evidence given by
4 panel one we were told, I don't have
5 the reference for the moment so you will
6 have to take my word for it, but as you
7 move toward final design there would be a
8 progressive upgrading of the terrain typing
9 on the alignment sheets. Is that your
10 understanding of what will happen?"

11 Answer:

12 "My understanding of what will happen is
13 that the analysis of terrain typing
14 that we have done now, which includes all
15 of the bore hole information that has
16 been made available to us would be updated
17 as any more bore hole information becomes
18 available."

19 On the following page, question:

20 "So that the updating is going to depend
21 on the reconnaissance, the geophysical
22 studies and bore holes?"

23 Answer:

24 "Yes, sir."

25 Now, what I would like to ask you with regard to those
26 two bits of evidence that were given with respect to
27 the use of the terrain typing and its improvement
28 by bore holes, if you have any comment on that as
29 the applicants move toward final design and construction,
30 if you have any comments on the adequacy of that.

Now, if you throw away your terrain characterization after you put your line in and go to ^a more or less rule of thumb every mile, a hole, or so many holes per acre of airfield or some such thing, that you are not getting the maximum result for the dollar spent. It is more than -- it is primarily an engineering consideration, but it does have an environmental aspect to it too, because it's engineering misjudgments or shortage of information that will lead to environmental problems so that I feel that by doing the terrain characterization you know that there are some units -- you find that there are some units are highly variable within the unit. You find that others are highly uniform within the unit, so that you are satisfied with very little confirmatory evidence for the very uniform units and you recognize the necessity for very dense drilling in the highly variable units. In discussion, you know, in reading the evidence, and in talking to soils engineers, I don't feel that, you know, I am a bit of an evangelist on this point and I don't feel that I really convinced them of both the economic and the environmental value

O.L. Hughes
Cross-Exam by Scott

1 of doing this in depth terrain characterization, but
2 this hasn't destroyed my faith in this characterization
3 as an engineering method.
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O.L. Hughes
Cross-Exam by Scott

1 Q Is it the characteriza-
2 tion that leads you to -- or that should lead you
3 to determine where the bore holes go, if any?

4 A Yes, it should be a
5 major influence on where you put most of your drilling
6 dollars.

7 Q Well now, the third
8 matter and the matter which Mr. Hollingworth is
9 undoubtedly right, and which is perhaps not raised by
10 your examination in chief, we've heard from Arctic
11 Bas as to the place at which they will stop chilling
12 the pipeline, namely the station immediately north of
13 the Alberta border. We have heard from Foothills that
14 they will stop at Fort Simpson, and Dr. Adam has given
15 a rationalization for us, stopping at the Willowlake
16 River. Now I want you to leave aside for a moment
17 the implications of frost heave per se, and look at
18 the limit of chilling from an environmental point of
19 view, and let us assume that I was to invest you with
20 the appropriate sums of money and the appropriate
21 staff, what are the steps that you would take to
22 determine the place where chilling should stop, if
23 at all, on this route?

24 A Well, I can explain the
25 steps that I would take. I can't predict what the
26 answer would be.

27 Q No, no, I understand that
28 I haven't asked you to do that, and that you haven't
29 perhaps the resources to do it, but we've heard a lot
30 about picking this place or that place. What I want

O.L. Hughes
Cross-Exam by Scott

1 to see if we can get from you is a technique or a
2 scheme or a course of study that would tell us, in
3 your judgment, within whatever is the appropriate
4 margin of error, the place where chilling should
5 terminate.

6 So what would you do if you
7 were given that mandate?

8 A Well, I would make an
9 initial assumption that the optimum change-over point
10 from chilled to hot is almost certainly somewhere,
11 I think, between Willowlake and the Alberta border.
12 I would get out the terrain analysis sheets and they
13 could be -- those prepared by Geological Survey or
14 by Dr. Mollard, there are differences in the systems
15 but the end result is not of serious consideration --
16 but I would want to go to that map and see what terrain
17 types constituted together most of that stretch of
18 the route, and then I would want the kind of terrain
19 characterization that I've described.

20 Q Of those terrain types?

21 A Of each of the terrain
22 types. Then I would want the help of a soils engineer
23 to predict, given this understanding of the natural
24 processes and what the materials are and how they're
25 disposed, to predict what the result would be of
26 placing either chilled line or a hot line in each of
27 those respective terrain units.

28 Q Well now, let me stop
29 you there for a moment. You've added up the total of
30 terrain types in the area under consideration.

O.L. Hughes
Cross-Exam by Scott

A Right.

Q You then got your characterization of each of those types, then the third thing you do is you get a soils engineer who tells you what a hot pipeline is going to do in that characterized soil, and what a chilled pipeline is going to do. Is that right?

A Thats right.

Q And when we say what it's going to do, what do you mean?

A By that I mean what is going to -- what changes are going to happen in the terrain, in the way of subsidance, the changes in the terrain, frost heave of drainage ways and the speckled bog, the sinuous wet depressions, that carry the drainage whether frost heave could block those, cause drowning and accelerate thermokarst development within that unit. The next step I would say would be to get an environmentalist to say, "all right now, here is what the engineer has told us what physically is going to happen what environmental values are going to be affected in each of these terrain units." By the hot or the cold line, and I would ask him further to weight the effects, that perhaps I'd go out on a limb and say on a 1, 2, 3 scale of the hot and the cold line; and then I would sum up the mileages of each of the terrain units. Now the pipeline goes across one terrain unit, crosses onto another, back onto the first one and so on, as you go along, and I'd take the mileages of each interval crossed, weighted according to the

O.L. Hughes
Cross-Exam by Scott

1 environmentalist's value that he places on the
2 terrain, and the effects that the hot or cold pipeline
3 would cause, and then I'd just use a cut and try
4 method - of course you could computerize this if
5 you want. I'd use a cut and try method from
6 there on to get a point which, for the change-over
7 which gave me a minimum loss of environmental values.

8 Q Well, do I understand
9 that the minimum loss of environmental values which
10 is where the chilling would stop at that point, is
11 a judgment that is essentially made in your scheme
12 by the environmentalists, weighing one against the
13 other?

14 A Well, he applies an
15 environmental -- the environmentalist's judgment of the
16 loss of environmental values that would be occasioned
17 by the physical change that the engineer has predicted
18 So that the two go together, you can't separate them.
19 I think this is the point I made privately on many
20 occasions, that there has been a good deal of separa-
21 tion of the physical effects and the environmental
22 effects.

23 Q Well, just leave aside
24 the frost heave problem for the moment, which is
25 somewhat different in scope, and concern ourselves
26 only with the integrity of the pipe, as laid,
27 in normal terms. Do I understand that it would be the
28 function of the environmentalist to say, "Well, we
29 stop chilling here, even though degradation may
30 result because the environmental consequences of that

O.L. Hughes
Cross-Exam by Scott

1 degradation are not great."

2 Would that be an environmental
3 judgment, or a engineering judgment?

4 A Well, particularly with
5 regard to the area generally south of Liard River,
6 most of the permafrost that you encounter is in
7 terrain types like this speckled bog or very similar
8 units, and an environmentalist might well decide that
9 the biologic productivity of that type of terrain
10 and the effects of the -- and looking at that and then
11 looking at the projected effects on terrain might
12 decide that environmentally at least that there is very
13 little to be lost in allowing degradation.

1 The danger, I think of
2 becoming too concerned about degradation of permafrost.
3 It is not the physical factor of degradation of perma-
4 frost that is of concern, it is the ensuing effect
5 of loss of environmental values that should focus
6 on, plus any aesthetic effects, but my personal judg-
7 ment would be some of the boondocks south of the Liard
8 River, you know, has relatively lower aesthetic value,
9 but I don't know, there may be some bog lovers in the
10 crowd, so --

11 Q Put do I understand
12 that that judgment after the characterization is made,
13 that that judgment is formed by an environmentalist's
14 assessment of the impact of either chilling or not
15 on the biological life of the area?

16 A Yes, but I interjected
17 there with the environmentalist doesn't make the
18 judgment as to what the physical change of the terrain
19 is going to be. That has to be made by a soils engineer
20 hopefully with his computer program and maybe with some
21 help from the physical geomorphologist or --

22 Q Yes, but once the soils
23 engineer has made the analysis, whether the consequences
24 of one are, of chilling or not chilling are bearable,
25 is the judgment of whom?

26 A I would say an environ -
27 mentalist and by that I would probably mean several
28 people.

29 Q A number of environmental
30 disciplines.

O.L. Hughes
Cross-Exam by Scott

1 A Wild fowl experts,
2 the whole gamut of people in the environmental
3 field.

4 MR. SCOTT: Those are all
5 the questions I have, thank you, Mr. Commissioner.
6 Thank you, Dr. Hughes.

7 THE COMMISSIONER: Could I
8 just ask you, Dr. Hughes, if you have an opinion
9 that you wish to express on this question of where
10 chilling should terminate --

11 A Well, I haven't done
12 this exercise and I don't think the decision should
13 be made without that exercise.

14 I would add one point that
15 occurs to me, that I neglected to mention, that if
16 you pick, you know, having picked the point by this
17 system or some other comparable system, you have
18 to look downstream in the direction of gas flow and
19 see that there isn't one critical short interval
20 that absolutely demands chilling which will then
21 become the control point, and in this case we're
22 really talking about the Liard River crossing, I
23 think. Whether the Liard River crossing, for
24 example, would be a critical point that absolutely
25 demands chilling because of a problem of thaw unstable
26 materials in the valley wall.

27 THE COMMISSIONER: Well, does
28 anybody else want to ask any questions? I think that
29 when the Arctic Gas panel on frost heave returns for
30 cross-examination, that Mr. Hollingworth will have

1 his experts on frost heave here at that time and
2 Mr. Marshall's will be here because they are the
3 panel, so that they should notify you, Mr. Scott, if
4 they want to cross-examine Dr. Hughes on that subject,
5 and then he can be brought and give evidence in each
6 immediately proceeding the panel.

7 MR. SCOTT: I should emphasize,
8 Mr. Commissioner, that that will be done, that I will
9 ask Dr. Hughes to return at any stage if that is
10 desirable. I just want to emphasize that the point of
11 this evidence is not really related to frost heave.
12 It is related to whether there is a legitimate
13 scheme for determining whether chilling stops. The
14 point that has concerned me is that both applicants, and
15 I may have done less than justice to their evidence,
16 appear to be rather vague in the way in which they
17 selected that point. Dr. Adam has advanced a theory,
18 but neither applicant has and I would hope that this
19 evidence, if nothing else has provoked both applicants,
20 in due course, to tell us how they have selected the
21 point at which chilling will terminate.

22 THE COMMISSIONER: Provoked
23 their lawyers anyway.

24 MR. SCOTT: Well, that may
25 not be enough.

26 MR. HOLLINGWORTH: That is
27 easy to do.

28 THE WITNESS: May I --?

29 THE COMMISSIONER: Yes,
30 go ahead.

1 A I want to emphasize
2 that when you framed your last question you said
3 "put aside the frost heave problem", you know, that
4 has to be -- that and a lot of other considerations,
5 have to come into this other than purely the environ-
6 mental aspect of it.

7 MR. SCOTT: I understand, I
8 was simply not asking you, Dr. Hughes --

9 A I say this because sometimes
10 the answers towards the end get detached from the
11 conditions imposed in the front.

12 MR. SCOTT: It is an experience
13 that we know at this Inquiry.

14 THE COMMISSIONER: Any
15 re-examination?

16 MR. MARSHALL: No, sir, I
17 just might comment. Northern Engineering and
18 Arctic Gas have underway a number of programs that
19 are related to the various recommendations that Dr.
20 Hughes has given and I will ask Dr. Clark when
21 he is back to speak to that.

22 THE COMMISSIONER: Fine.

23 MR. HOLLINGWORTH: I will
24 have our people speak to this matter.

25 THE COMMISSIONER: All right,
26 well, thank you very much, Dr. Hughes and we appreciate
27 your coming here again for cross-examination and
28 it appears that you may be back but that is all in a
29 good cause.

30 THE WITNESS: Thank you.

(WITNESS ASIDE)

MR. SCOTT: Mr. Commissioner, before we adjourn on the assumption, tenuous at best that Mr. Hollingworth and Mr. Marshall are still speaking to me, I wonder if we could have a short meeting of council at the conclusion of this.

MR. MARSHALL: Yes, we have laid on a supply of ice water for Mr. Scott, and -- Sir, I was just wondering about tomorrow. It wasn't clear to me whether Mr. Anthony's other two witnesses were going to be available early on or whether we wanted to start with something else.

MR. ANTHONY: Mr. Commissioner, I believe that Dr. Rutter will be here tomorrow morning. He is coming in this evening and will be available to start tomorrow and I advised all my friends that Dr. Roede is expected to be finished his appearance before the Ontario Municipal Board today and if possible would catch the evening flight out of Toronto tonight and would be available tomorrow mid-afternoon, so I would propose to proceed with Mr. Rutter tomorrow morning and Dr. Roede thereafter, probably in the afternoon at whatever time the plane decides to arrive.

THE COMMISSIONER: Do you want to start at nine, or can we start at ten tomorrow?

MR. ANTHONY: Well, I believe that Mr. Rutter will be in this evening, so at a convenient time to yourself and to the Inquiry.

1 THE COMMISSIONER: Well, I leave
2 it to counsel. When do you say, nine or ten?

3 MR. SCOTT: Well, Mr. Com-
4 missioner, you have a community hearing tomorrow
5 night and we will all of course attend so really
6 the timetables should be dictated by you because you
7 do have that engagement which may take you most of
8 the evening. If you would rather begin at nine
9 in the hopes that we could finish earlier in the
10 day or if you would rather begin later --

11 MR. ANTHONY: Nine is
12 fine with me.

13 THE COMMISSIONER: All right
14 let's begin at 9:30. If we start --

15 MR. SCOTT: Mr. Commissioner,
16 could I suggest one other thing. It occurs to us
17 looking at the evidence of Mr. Rutter and Mr. Roede,
18 that if they are both here, it might be useful and
19 expeditious if both of them were led through their
20 examination in chief before cross-examination of
21 either of them took place. If they are not both
22 here, I would hope that Mr. Rutter could be persuaded
23 to stay until Mr. Roede has given his evidence, because
24 there is some interaction that is possible between
25 those two witnesses. However, I leave that to Mr.
26 Anthony and he can let us know tomorrow what could
27 be done.

28 THE COMMISSIONER: Okay
29 (PROCEEDINGS RESUMED TO OCTOBER 22, 1975)
30

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GOVERNMENT OF CANADA
MACKENZIE VALLEY PIPELINE INQUIRY

Government
Publication

IN THE MATTER OF APPLICATIONS BY EACH OF
(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS
CROWN LANDS WITHIN THE YUKON TERRITORY AND
THE NORTHWEST TERRITORIES, and
(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY
THAT MIGHT BE GRANTED ACROSS CROWN LANDS
WITHIN THE NORTHWEST TERRITORIES
FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINE

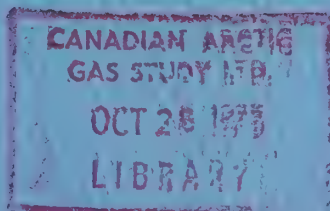
(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.,

October 22, 1975.

PROCEEDINGS AT INQUIRY

Volume 77



APPEARANCES:

Mr. Ian G. Scott, Q.C.
Mr. Stephen T. Goudge,
Mr. Alick Ryder and
Mr. Ian Roland for Mackenzie Valley
Pipeline Inquiry;
Mr. Pierre Genest, Q.C.
Mr. Jack Marshall,
Mr. Darryl Carter, and
for Canadian Arctic Gas
Pipeline Limited;
Mr. Reginald Gibbs, Q.C.
Mr. Alan Hollingworth for Foothills Pipelines
Ltd.;
Mr. Russell Anthony,
Prof, Alastair Lucas for Canadian Arctic
Resources Committee;
Mr. Glen W. Bell and
Mr. Gerry Sutton for Northwest Territories
Indian Brotherhood and
Metis Association of the
Northwest Territories;
Mr. John Bayly for Inuit Tapirisat of
Canada and the
committee for Original
Peoples Entitlement;
Mr. Ron Veale and
Mr. Allen Lueck for the council for the
Yukon Indians
Mr. Carson H. Templeton for Environment Protect-
ion Board;
Mr. David Reesor for Northwest Territories
Association of Muni-
cipalities
Mr. Murray Sigler for Northwest Territories
Chamber of Commerce

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Yellowknife, N.W.T.

October 24, 1971.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. SCOTT: Mr. Commissioner, we had a productive meeting of counsel last night and perhaps I could advise with respect to two matters of time-table.

First of all, this week we will, time allowing, have the examination in chief of Arctic Gas' first panel in Phase 2 and 3.

Next session we will have cross-examination of that panel.

Following that, Foothills will call its first panel in Phase 2 and 3, which will cover generally terrain, water and air matters. That will be followed in turn by Arctic Gas' second panel for Phase 2 and 3, which will deal with impact on living things to be followed in turn by two panels, of Foothills witnesses covering impact on living things.

Then we will be ready for participants' evidence in Phase 2 and 3, which will take the order that it has taken in Phase 1.

It is our hope that we will complete the second and third phases in December.

We also discussed, subject to your direction, the time-table for the early part of next year and we propose as follows, that we should sit at Inuvik in formal hearings in the week of January 12th and January 19th; that the week of January 26th

1 should be -- we should have no hearings. We should sit
2 at Inuvik the weeks of February 2nd and February 9th
3 in formal hearings, and that during those four weeks
4 in Inuvik, at dates to be arranged, we would conduct
5 the community hearings for the Town of Inuvik.

6 February 16th we would have
7 community hearings in northern communities to be
8 specified by Professor Jackson and Mr. Bayly at a
9 later date.

10 February 23rd will be a week
11 in which there will be no sittings.

12 The week of March 1st we will
13 have community hearings at northern communities to be
14 specified later by Mr. Jackson and Mr. Bayly.

15 We will have formal hearings
16 at Yellowknife in the weeks of March 8th, 15th, and
17 22nd.

18 Now the only reservation about
19 that time-table is twofold:

20 (1) If by any chance we do not complete Phase 2 and 3
21 evidence by the end of December, we would hope to
22 complete it in the first week of January, and would
23 sit here for that purpose before going to Inuvik.

24 THE COMMISSIONER: That is the
25 week of --

26 MR. SCOTT: January 1960

27 The feeling, Mr. Commissioner,
28 was that there was no virtue to opening the formal
29 hearings of the Inquiry in Inuvik if we were going to
30 be dealing with tag-ends from Phase 2 and 3, and logistics

1 make it desirable that we should complete that here.
2 Therefore, if by any chance, which seems remote, that
3 we're not finished Phases 2 and 3 by December, by the
4 end of December, we would take the extra days that are
5 necessary to complete it here in Yellowknife before
6 going to Inuvik. That creates some reservation problems
7 but Mr. Waddell says those can be taken care of.

8 The other reservation is that
9 the communities, the northern communities conceivably
10 may not be satisfied with the weeks of February 16th
11 and March 1st for community hearings. Mr. Bayly and
12 Professor Jackson tell me that they will know as a
13 matter of certainty whether any change is requested by
14 early November, and therefore I think if we've not
15 heard anything by the middle of November, we may assume
16 that this time-table is then fixed.

17 I'm grateful to the counsel
18 that were at the meeting last night for their help in
19 making these arrangements, if they're satisfactory to
20 you.

21 MR. HOLLINGWORTH: Mr. Commis-
22 sioner, one comment I have, and that's on the
23 scheduling of the panels for Phases 2 and 3. Originally
24 it had been thought that Phases 2 and 3 would be
25 combined, and that in the normal course we would have
26 followed -- that is to say Foothills would have
27 followed Arctic Gas, and that was the assumption that
28 we've been working on, and the assumption that our
29 panels have been working on in preparing their evidence.
30 Against my opposition, and I stood alone on this, the

1 order is now changed and our Panel 1 will be following
2 Arctic Gas'. My only reservation with the arrangement
3 that has been made now is that I don't want it said
4 that there is a failure on the part of Foothills to
5 meet its two weeks of notice. I expect it will be
6 able to, but with the mail strike and with this new
7 arrangement that has been thrust upon us we may be
8 a little shy of that two weeks. I just want to
9 make it clear at this time.

10 THE COMMISSIONER: Well, I'm
11 sure no one would---

12 MR. SCOTT: Now, Mr. Holling-
13 worth now protected his flank, perhaps we can move
14 onto today's work.
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N.W. Rutter

1 THE COMMISSIONER: That means
2 a three week break at Christmas, is that the outcome
3 of all of that?

4 MR. SCOTT: Yes, it is, sir.

5 THE COMMISSIONER: Okay, so --

6 NATHANIEL WESTLUND RUTTER, sworn

7 MR. ANTHONY: Mr. Commissioner,
8 we will proceed on now with new evidence relating to
9 the question of alternate routes. You will recall
10 at Whitehorse Dr. Hughes gave evidence -- sorry, on
11 the question of terrain conditions and various alter-
12 nate routes in the Yukon, and his cross-examination
13 was completed yesterday.

14 We now propose to take a look
15 at the terrain conditions and possible alternate
16 routes they suggest in the Mackenzie Valley. CARC
17 is presenting two independent studies dealing with
18 various aspects of the question in the Mackenzie
19 Valley. We have Dr. Nat Rutter this morning who will
20 be discussing terrain considerations on the east of
21 the Franklin Route, the portion that he has studied and later
22 on we will be calling Dr. Murray Roede who will be
23 discussing some of the considerations of different
24 areas east of Franklin Mountains and extending those
25 considerations eastward to the edge of the shield.

26 As I say, Dr. Rutter is with
27 us now and I would like to proceed with his introduction
28 to the Inquiry and the giving of his evidence.

29 THE COMMISSIONER: Has Dr.
30 Rutter been sworn?

1 MR. ANTHONY: He has, I believe,
2 this morning.

3 THE SECRETARY: Yes.

4 THE SECRETARY: Well, Miss
5 Hutchinson, you might distribute to all participants
6 and the C.B.C. that new schedule for next year tomorrow
7 if it can be ready in time.

8 DIRECT - EXAMINATION BY MR. ANTHONY:

9 Q Dr. Rutter, your experience
10 in the Mackenzie Valley area and background experience
11 has been distributed as a biographical note
12 with your evidence. I wonder if you would introduce
13 this experience and qualifications to the Inquiry by
14 summarizing the biographical data circulated with
15 your evidence?

16 A Yes, I was graduated from
17 Tufts University with a B.S. in Geology, 1955; and
18 later my Masters Degree was from the University of
19 Alaska in Geology in '62. After this I attended the
20 University of Alberta in Edmonton receiving a PhD in
21 Geology in 1965. During this time I had experience in
22 the -- with the Snow, Ice, Permafrost Research
23 Establishment as a student in Greenland during my
24 undergraduate years, and at the University of Alberta
25 I majored in glacial geology, sedimentary petrology,
26 geomorphology, stratigraphy, palynology and soil
27 science.

28 As far as professional exper-
29 ience in 1955 to 1958 I was a field geologist with
30 the Venezuelan Atlantic Refining Company and did field

1 work in Venezuela, Trinidad, Columbia and Turkey.

2 I then went on after this
3 for my PhD and subsequent to this I joined the
4 Geological Survey of Canada and was research scientist
5 from '65 to 1974. I was engaged in Quaternary research,
6 that is deposits and events that took place in the
7 last million and a half years or so and geomorphology.

8 Towards the end of my career with the Geological
9 Survey I worked with surficial geology and land
10 classification in the Mackenzie Valley transportation
11 corridor.

12 I was also during this time
13 a part time instructor at the University of Calgary
14 and taught course in soils, Quaternary environments,
15 stratigraphy and airphoto interpretation.

16 In 1974 I went to Ottawa with the Geological
17 Survey and I headed the urban project section of the
18 G.S.C. in Ottawa and a year later I joined the
19 National Energy Board as Environmental Advisor. My
20 job there was assessing environmental implications
21 of applications before the Board.

22 At the present time I am
23 Associate Professor of Geology at the University of
24 Alberta in Edmonton.

25 My professional affiliations
26 include the Geological Association of Canada, the
27 Geological Society of America, the Arctic Institute
28 of North America, the Society of Economic Paleontologists
29 and Mineralogists. Other current affiliations include
30 the advisory committee for the Faculty of the

N.W. Rutter

1 Environmental Science at the University of Calgary
2 and the Geological Advisory Committee, in the Research
3 Council of Alberta.

4 MR. ANTHONY: Mr. Commissioner,
5 attached also to the bibliography is an extensive
6 list of publications of Dr. Rutter's and that will
7 be tabled along with his biography and statement of
8 evidence as an exhibit.

9 (RESUME, 'LIST OF REPORTS AND SUMMARY OF EVIDENCE OF DR.
10 N.E. RUTTER MARKED EXHIBIT 290)

11
12 MR. ANTHONY: Dr. Rutter, would
13 you perhaps start out by describing the Terrain Evalua-
14 tion studies you conducted in the Mackenzie Valley?

15 A Yes, I conducted
16 preliminary terrain evaluation of the Mackenzie
17 Transportation Corridor, the southern part during
18 1971 - 1972. The objectives of the investigation
19 were to map, describe and explain the unconsolidated
20 deposits, land forms, permafrost, ground ice, and
21 organic cover of the study area in order to provide
22 aerial knowledge of geology and terrain, with
23 particular reference to the needs of government for
24 terrain information in connection with land use
25 planning and pipeline proposals and other aspects of
26 petroleum development and construction and engineering.

N.W. Rutter
In Chief

1 The results of our study were
2 published as part of the environmental social program,
3 Volume 7336, which the report is tabled.

4 MR. ANTHONY: Mr. Commissioner,
5 the E.S.P. report has been left with Miss Hutchinson,
6 and is tabled as an exhibit, and it's the report
7 left on your desk.

8 THE COMMISSIONER: All right.

9 A The principal part of
10 the report describes only those areas that are included
11 in a broad corridor, which is of interest to industry
12 and government for pipeline routes, both gas and oil.
13 However, the discussion of the broad corridor is appli-
14 cable in general, in a general way to the adjacent
15 areas. Therefore we had the entire area investigated.

16 MR. ANTHONY: Q You referred
17 to a broad corridor which is of interest to industry
18 and government for pipeline routes. Would you describe
19 this corridor, how the limits of the study were
20 determined, and the area studied?

21 A Yes, the southern
22 Mackenzie transportation corridor has been divided into
23 four areas. Mr. Commissioner, I refer you to figure 2
24 of the report.

25 MR. ANTHONY: Mr. Commissioner, that
26 figure 2 has been photo-copied and is the figure
27 attached to the statement of evidence.

28 A Well these are -- the
29 different areas are based on similarities of terrain,
30 taking into account the surficial deposits, distribution

N.W. Rutter
In Chief

1 of permafrost and ground ice, and physiography. They
2 form a broad north-south route roughly in the central
3 part of the area mapped. The east and west boundaries
4 are drawn close to the limits of the area of interest
5 to government and industry for pipeline routes. The
6 characteristics of each of these areas is similar to
7 the adjacent areas to the east and west, so it is
8 possible to extrapolate the discussion of one area to
9 the other. In other words the area which extends beyond
10 these boundaries, you can come back and you can extrap-
11 olate the information you find in one area with the
12 other, to a certain extent.

13 So the actual area map was much
14 broader than taking in 11 map sheets. Mr. Commissioner,
15 I refer you to page 3 of the report.

16 Q Mr. Commissioner, that
17 figure 1 is also photo-copied, indicating the mapped
18 area. Perhaps I could stop this so that we understand
19 the distinction. Do I understand then that while the
20 E.S.P. program concentrated on those areas you've
21 outlined in figure 2, the map study area was much
22 broader to include the wider area that's outlined in
23 figure 1?

24 A Yes, the idea was to
25 map as much terrain as possible in two summers under
26 limited manpower and funding in those areas most likely
27 to be developed in the next few years.

28 The boundaries for the E.S.P.
29 73-36 Report were arbitrarily set by me, in consulta-
30 tion with the personnel of the Environmental Social

N.W. Rutter
In Chief

1 Program and the Geological Survey of Canada. The
2 study involved first a general overview of the area,
3 including a short discussion on the physiography,
4 bedrock geology, distribution of surficial deposits
5 and permafrost, and the major rivers that would have
6 to be crossed by a pipeline. Surficial deposits were
7 dealt with more specifically in terms of distribution,
8 morphology, thickness, lithology and texture. Included
9 were notes on the overlying organic deposits, distri-
10 bution of permafrost and ground ice and surface drain-
11 age, which form an integral part of the behaviour of the
12 deposits as a whole, especially when considering const-
13 ruction. A general description and hazards or suita-
14 bility of potential pipeline crossings of major rivers
15 in the area were presented.

16 Figure 2 then shows the various
17 areas that I'll be discussing below. Once again I
18 refer you to figure 2 area, 1 area, 2 area, 3 area, and
19 4.

20 Now, area 1 includes for
21 the most part the western part of the Kakisa River
22 map-area and the eastern part of the Trout Lake map-
23 area. The physiography and terrain characteristics
24 of Area 1 are similar to those to the east and to the
25 west as far as the Liard River, covering most of the
26 geologically mapped area.

27 Area 2, which is composed
28 largely of parts of the Fort Simpson and Sibbeston
29 Lake map areas, contains large areas of lacustrine and
30 eolian sediments. These are generally different from

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In Chief

1 from the deposits found to the east and west, however,
2 the terrain characteristics in the area of the Martin
3 Hills in the north-west part of the Area 2 are similar
4 to those found as far west as the Nahanni Range. The
5 eastern part of Area 2 consists of till and lacustrine
6 deposits with permafrost characteristics similar to
7 those found to the east covering the major part of
8 the Mills Lake map area.

9
10 Going north into Area 3,
11 Area 3 comprises small parts of the Fort Simpson,
12 Sibbeston Lake, Camsell Bend, and the Bulmer Lake
13 map areas, has deposits consisting largely of till and
14 lacustrine deposits. Terrain characteristics in the
15 north-eastern part of Area 3, consisting mainly of
16 a till plain, are very similar to those found towards
17 the north in the Bulmer Lake map area.

18 Area 4 covers mainly the Camsell
19 Bend and Wrigley map areas, and contains lacustrine
20 sediments and till that are similar in character to
21 other areas of the corridor, but with more widespread
22 permafrost and ground ice. East of the Franklins,
23 outside Area 4 but within the Wrigley map area, the
24 terrain consists largely of till similar to that
25 found to the south but with permafrost characteristics
26 similar to that of Area 4.

27 Mountainous regions are found
28 in several of the western map areas, particularly the
29 Root River and Dahadinni areas. They are not described
30 here as these areas are unsuitable for pipeline routes.
However, the surficial deposits within the mountains

N.W. Rutter
In Chief

1 were mapped for completeness, and the lithology of
2 the bedrock indicated.

3 Q Would you describe
4 briefly the geology and geomorphology of the study
5 area?

6 A Yes. Our study deals
7 with the Mackenzie Valley and the surrounding regions
8 from the provincial boundary at latitude 60, northward
9 about 250 miles at latitude 64 degrees. The
10 area consists of plains with broad uplands in the
11 southern and eastern portions, and rugged mountains in
12 the west. In the south, the Mackenzie River winds
13 its way towards the west, is joined by the Liard River
14 near Fort Simpson, then continues westward to the base
15 of the Nahanni Range, which swings north and occupies
16 for the most part a broad valley between the Mackenzie
17 and the Franklin Mountains.

18 Moraine consisting of till
19 is by far the most abundant surficial deposit and cover
20 most of the plains and the upland areas. Fine-grained
21 lacustrine sediments cover wide areas adjacent to the
22 Mackenzie River in the southern and the northernmost
23 areas. Eolian sand, glacial and post-glacial
24 fluvial sand and gravel make up most of the remainder
25 of the surficial material.

26 THE COMMISSIONER: Dr. Rutter --

27 A Yes.

28 Q -- what is eolian sand?

29 A Eolian, M r. Commissioner,
30 is wind-blown material that's been picked up and re-

N.W. Rutter
In Chief

1 deposited by the wind.

2 THE COMMISSIONER: Thank you.

3 A Now one of the most
4 important mapping units consists of organic deposits
5 which form large tracts throughout the plains and
6 the upland areas. Smaller patches of these deposits
7 are mapped along with the surficial material. In
8 the present study, the organic deposits are sub-divided
9 into two main varieties -- bogland and fenland, although
10 some deposits are transitional between these two cate-
11 gories. The former consists of peat plateaus and
12 palsas, whereas the latter comprises swampy depressions
13 and ponds.

14 (TERRAIN EVALUATION RE PIPELINE CONSTRUCTION
15 DATED DECEMBER 1973 MARKED EXHIBIT 291)

16 (INDEX MAP OF TERRAIN MAPPING, MACKENZIE
17 TRANSPORTATION CORRIDOR, MARKED EXHIBIT 292)
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N.W. Rutter
In Chief

The southern Mackenzie Transportation Corridor is in the Discontinuous Permafrost Zone. In the southern part of the area permafrost with ground ice is found within two feet of the surface in bogland and extends downward through the organic deposits in the underlying till or lacustrine deposits to a depth of at least 15 feet. Ground ice is also found discontinuously below about five feet in fine-grained lacustrine deposits on either side of the Mackenzie River west of Fort Simpson under a rather thin organic cover and tall stands of timber. North of the Willowlake River, permafrost and ground ice become much more widely distributed and permafrost is present not only in bogland areas, but also in most of the fine-grained lacustrine deposits and in poorly drained till areas. In both cases visible ground ice makes up a high percentage of the total volume in at least the upper ten feet. In the extreme north, lacustrine deposits contain permafrost to a depth of at least 50 feet. The only occurrence of permafrost in coarse-grained sediments is in the post-glacial sand in valleys of the Mackenzie Mountains in the northwestern part of the area.

Q What are the major terrain hazards encountered in the study area?

A The major terrain hazards affecting pipeline environmental effects and engineering appear to be: areas of fine grained sediments that are subject to frost heaving, collapse caused by melting of indigenous ice, and flowage and

N.W. Rutter
In Chief

1 slumping on exposure, thick organic deposits with
2 high moisture content consisting of frozen bogland and
3 unfrozen fenland that are subject to collapse upon thawing
4 and frost heaving upon freezing, areas with a high
5 rate of surface runoff caused by impermeable frozen
6 material near the surface which can cause flooding by
7 collecting in ditches and other construction depressions
8 and river crossings where the approaches, scarps and river
9 bed characteristics may be hazardous.

10 Q What general conclusions
11 did you reach concerning pipeline routing through the
12 study area?

13 A The best routing, from a
14 purely terrain standpoint, would fall within the
15 broad corridors studied in Areas I, II and III. The
16 only place it falls outside of the broad corridor of
17 interest to government and industry is in the north where
18 the most acceptable pipeline route runs east of the Frank-
19 lin Mountains.

20 Q Dr. Rutter, would you
21 describe in more detail Area IV where you say the
22 best pipeline route is east of the Franklin Mountains
23 and outside the broad corridor being considered by govern-
24 ment and industry?

25 A Part of Area IV contains
26 terrain conditions which will cause major construction
27 problems. These include: the thick organic matter
28 consisting of unfrozen fenland and frozen bogland,
29 the active thermokarst subsidence, fine-grained ice-rich
30 lacustrine sediments and fine textured till that may

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1 contain a high percentage of ground ice and many
2 river crossings with hazardous approaches.

3 There are three possible
4 routings: west of the Mackenzie River, between the
5 Mackenzie River and the Franklin Mountains and east
6 of the Franklin Mountains -- I can point these out
7 on the map, if you like.

8 What I am talking about then is
9 in the southern Mackenzie we are talking about the
10 west side of the Mackenzie River along the valley
11 and the east side of the Mackenzie River and the
12 west side of the Franklin Mountains which is the
13 route that is of interest to the industry and
14 government and east side of the Franklin Mountains.

15 THE COMMISSIONER: I can't
16 see.

17 A Sorry --

18 THE COMMISSIONER: The route
19 chosen marked there is the east side of the river and
20 the west of the Franklins?

21 A This is the route that
22 is already marked on there, right. The routes I
23 considered, one was on the west side of the Mackenzie
24 River, south, and the other was east of the Franklin
25 Mountains.

26 THE COMMISSIONER: How far
27 would the route east of the Franklins be on the
28 average to the east of the route the pipeline companies
29 want to take?

30 A How much of a greater

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1 distance?

2 THE COMMISSIONER: Pardon me?

3 A A greater distance,
4 or length -- pardon me, I am sorry, I missed the
5 question.

6 THE COMMISSIONER: How far
7 to the east on the average does it lie?

8 A Okay, well, we are
9 talking about over the Franklin Mountains and south
10 about 20 miles east of the east side of the mountains
11 themselves. This sort of dimension at any rate.

12 The best routing based
13 on terrain considerations is east of the Franklin
14 Mountains. Continuing the routing from Area III, you
15 enter Area IV in the south-central part and head roughly
16 north. The routing here is divided in order to avoid
17 a depression of poorly drained, fine-grained sediments with
18 a thick organic cover in which thermokarst subsidence
19 is active. On the east side of the depression the line
20 would run through a fairly well drained till plain
21 with only a minimum variation in local relief and
22 a regional slope that should be easily managed. A
23 few abandoned meltwater channels will have to be
24 crossed, but these are minor and should offer little
25 difficulty. On the west side of the depression, the
26 terrain is not as desirable but it is still adequate.
27 The topography and lithology are more varied with the
28 presence of thin, mostly less than four feet thick,
29 lacustrine silt and sand overlying till, coarse glacial
30 and post-glacial sediments and till.

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Northward from the Willowlake River to River Between Two Mountains, terrain conditions are adequate although here fairly well-drained till, with morphology consisting of drumlinoid ridges and flutings --

THE COMMISSIONER: What are drumlinoid ridges?

A Drumlinoid ridges and flutings are basically erosional features formed by glaciers. They take the form, as far as drumlins are concerned, of a streamlined drop shaped structure, whereas flutings are streamlined long, narrow ridges and is a continuum between two end products, here you go from a drop shape to intermediate structures to long, narrow ridges, which consist of surficial deposits and also of bedrock materials. It is an erosional feature.

These drumlinoid ridges and flutings vary to a relatively flat plain, and coarse glacialfluvial sediments, including eskers and kames are present. The eskers and kames are ice contact deposits containing generally gravel and sands, melt, a product of glacial melting. There are areas to avoid that consist of thick organic terrain and lacustrine silt and clay. Continuing east of the Franklins, up the valley of the River Between Two Mountains, fairly well drained till, some associated with southeast-trending drumlinoid ridges and flutings, thin till over bedrock, and colluvium are encountered. By colluvium I mean by reworked material, redeposited material, by mass wasting. Gentle slopes and

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1 occasional abandoned meltwater channels will have to
2 be crossed, but they should not cause major difficulties.
3 At the west end of Fish Lake, the routing trends
4 north-eastward through till with little surface mor-
5 phology except for a few crevasse fillings and flutings.
6 There is bogland in this area, so that details of the
7 specific route will have to be chosen carefully.
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Next, the route shifts to the north-west, running parallel to a major fluting field that continues to about the Blackwater Lake. It should be possible to locate lines in relatively ice-free, well-drained parts of these flutings. On the south side of Blackwater Lake, the corridor shifts to the north and then along the east side of the lake. The terrain and lithologic types are available in this area and consist mostly of hummocky, fluted and drumlinized till, and glacial and post-glacial fluvial gravel and sand. Thick organic matter is present in a few areas, but can be avoided. The Blackwater River will have to be crossed, but should not cause major difficulties because the river meanders only slightly with its floodplain and channel material being mostly sand. North of the river, a till plain and south-west trending flutings will be encountered, but they should not be major obstacles.

The second routing then is between the Mackenzie River and the Franklin Mountains. This routing has been favored by industry and is followed by the proposed highway, but it does have certain disadvantages that the routing east of the Franklins does not have. The routing is the same for both from the boundary of Area 3 and Area 4 to just north of the Willowlake River. From here northward, conditions change. North to about the River Between Two Mountains on the west side of the Franklins, drumlins, striking north-westward and composed of till, cover most of the proposed routing. The crests of the drumlins are well

drained and are probably permafrost-free, whereas in the depressions where drainage is poor, permafrost and subsequently ground ice may be present. Construction problems in the better drained areas will be relatively minor with one exception. Huge boulders, commonly several feet across, are found on the crests of some of these drumlins. Removal of these boulders may be difficult.

For most of the routing north of the River Between Two Mountains the terrain is underlain by a lacustrine silt and clay with a high percentage of ground ice, and widespread occurrences of organic matter, mostly in the form of bogland. These conditions, of course, offer major problems and unfortunately are multiplied by numerous rivers that have to be crossed if this routing is followed. There are, however, abandoned meltwater channels, some of which form discontinuous terraces along the Mackenzie that may be utilized during construction. Although ice-rich silt may overlies portions of these channels, channel sediments are fairly good that relatively ice-free, coarser materials will be encountered.

The third possible routing lies west of the Mackenzie River and east of the Franklin Mountains. The terrain consists mostly of ice-rich lacustrine silt and clay and till, some forming well-drained, ice-free drumlins and hummocks. Although the presence of till improves the terrain conditions on this side of the river, compared to the other side, disadvantages are that braided rivers

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1 would have to be crossed, as well as the Mackenzie, unless
2 of course, the routing was placed west of the Mackenzie
3 at Camsell Bend in Area 3. However, there would be
4 added terrain problems that would have to be overcome in
5 the Camsell Bend area.

6 THE COMMISSIONER: Sorry.

7 A Yes sir

8 Q Just -- you are going
9 through this very fast -- just so I understand where
10 we are --

11 A O.K.

12 Q -- you say that the route
13 east of the Franklins is the same as the route that
14 the pipeline people have chosen from -- oh, I see,
15 from the boundary between Area 3 and Area 4 to the
16 Willowlake River, that's the only area where they
17 correspond so far, is it?

18 A Well, in the southern
19 part of Area 3 in my report I do have ideas on where
20 I think a broad corridor or a routing should be,
21 but it's not that much different from what's proposed
22 by industry. As you enter Area 4, and this is when
23 it diverges.

24 Q Yes.

25 A From the original idea.

26 Q That's when you get into
27 the Franklins.

28 A That's right, yes.

29 Q O.K. You're, I think,
30 going to win the Inquiry prize for reading faster than

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1 anyone so far.

2 A I'm sorry.

3 Q It's quite all right,
4 but we'll do our best to keep up with you.

5 A Well no, I'll be glad to
6 slow down. However, there would be added terrain
7 problems that would have to be overcome in the Camsell
8 Bend area. I'm continuing now on the area west of the
9 Franklins.

10 Q Yes, I'm with you.

11 A This corridor has been
12 abandoned, though, by current proponents of a pipeline
13 route. It wasn't considered in great detail.

14 Q And you are not enamored
15 with that route anyway, I take it?

16 A No, I'm not.

17 Q So as far as you're conc-
18 erned, it comes down to the route they have chosen, or
19 east of the Franklins.

20 A That is correct, sir.

21 MR. ANTHONY: Q Dr. Rutter,
22 would you describe briefly -- and perhaps a mite
23 slower -- the most significant surficial deposits in
24 Area 4?

25 A Till deposits are wide-
26 spread in the uplands of the southern part of the area,
27 the piedmont area in the north, and along the Mackenzie
28 Valley bottom with the exception of the west and east
29 side of the river in the south-western corner and the
30 east side of the river in the northern part. Generally,

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1 the surface morphology is rather subdued with broad
2 hummocks and depressions having relief of only a few
3 feet. The major exception to this is the presence of
4 drumlinoid ridges and flutings in scattered areas,
5 principally in the north. On the east side of the
6 river in the southern part, they trend generally in a
7 west-northwesterly direction. In the north along the
8 Mackenzie Valley, they have a more northerly component.

9 Although there are variations
10 the matrix of the till has roughly equal parts of sand,
11 silt and clay. What I'm talking about here is the
12 fine-grained portion of the till itself. Inclusions
13 account for usually less than about 5% of the total
14 volume. All I'm talking about as far as inclusions
15 or class are the gravel-sized particles.
16 The till itself is generally fine-grained. The till
17 matrix strongly reflects the lithology of the under-
18 lying material, because the resistance of the shale,
19 the underlying material where most of this is found
20 contains clay and silt and this sort of thing, fine-
21 grained material, this is incorporated by the ice in
22 the ice, and then when it melts you have till forming
23 which is a reflection of that underlying material,
24 just because of the resistance. The inclusions of
25 the class within the till are principally derived from
26 the Canadian Shield, the more resistant material to
27 the east so we have the fine-grained material in the
28 till reflecting the local bedrock, most of it, and
29 then you have some of the class which is part of the
30 till too, but less than 5%, derived from the Canadian

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1 Shield, to the east; and the point here, of course,
2 is that this makes, because of the shale and the
3 underlying bedrock, the till itself can be -- is fine-
4 grained and can offer hazards when it comes to engineer-
5 ing. Four test-holes indicate that the moisture
6 content of the nine samples varies between about 12%
7 and 18% in the upper 22 feet of the unfrozen till. In
8 the frozen till, 42 samples from 12 test-holes indicate
9 that the moisture content varies between about 6 and
10 59%, in the upper 22 feet. Now this is just to give
11 you an idea that there is the moisture content can be
12 quite high.

13 Organic terrain is found over-
14 lying till in relatively flat, poorly drained areas.
15 Most commonly it is located in the uplands area in the
16 southern part and adjacent to the Willowlake River and
17 the west side of the Mackenzie in the central and
18 northern part. Except for a limited amount of fenland
19 in the south, over 90% of the organic terrain is bogla
20 Thicknesses vary but are generally between 6 and 9
21 feet. Peat polygons are found commonly in Area 4 along
22 the base of the east side of the Franklin Mountains
23 and in the northern part of the Wrigley map area.

24 In areas where the organic
25 cover is less than four feet thick, permafrost is
26 sporadic.

27 Lacustrine sediments are
28 widespread in the southernmost, central and northern
29 parts of the area bordering the Mackenzie River. In
30 the northern part, they are more extensive on the east

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1 side where they extend to the base of the Franklin
2 Mountains. In general, the lacustrine sediments form
3 a relatively flat plain with little surface morphology
4 except for the overlying organic terrain. Organic
5 terrain, mostly frozen bogland, is widespread,
6 forming irregular hummocks and water-filled depressions
7 and creating a deranged drainage network. Some of the
8 palsas have local relief up to 17 feet, whereas others
9 are actively degrading forming thermokarst lakes.

10 The most important terrain
11 characteristic of the lacustrine sediments is the wide
12 distribution of permafrost and subsequent ground ice.
13 As in other areas below extensive deposits of bogland,
14 till or fine-grained lacustrine sediments are frozen
15 and contain ground ice in at least the upper few feet
16 of the deposit.

In the central and northern parts of Area IV, permafrost and ground ice are found extensively in the lacustrine silts in moderately to poorly drained areas without regard to the thickness of the organic cover. About the only place permafrost is not found is in the well drained scarps and below pond and fenland areas. In general, permafrost is found within two feet of the surface and extends to at least 25 feet and probably to 50 feet or more.

In the southern area, permafrost and ground ice is less extensive in lacustrine deposits than in the central and northern parts. Not only is this attributed to lower latitudes, but extensive bogland cover is undergoing active thermokarst subsidence, resulting in permafrost patches between unfrozen ponds and marshes. I have been talking all about the Area IV.

MR. ANTHONY: Q Now, would you next comment --

MR. SCOTT: Speckles hog, Mr. Commissioner.

MR. ANTHONY: Dr. Rutter, would you comment briefly on the surface drainage as it applies to the till and lacustrine areas that you have been describing.

A The surface drainage rate and volume on till, for the most part, depend upon the regional and local topography and on the presence or absence of permafrost near the surface. In the southern

1 part of the area where there may not be permafrost,
2 that is on crests of flutings and drumlinoid ridges or on
3 slopes controlled by bedrock, runoff may be inhibited to
4 a certain extent by absorption into the till. However,
5 in the spring, before the active layer has melted, the
6 rate of runoff will be high and the low permeability
7 of the till will promote runoff. In the north, where
8 permafrost is close to the surface in most varieties of
9 terrain, a high rate and volume of runoff will
10 ensue both during spring melting and during intense
11 rains. Runoff will be slow and surface water will stand
12 in relatively flat areas and depressions aided by the
13 frozen bogs and deranged drainage.

14 Surface runoff is retarded in
15 the flat-lying lacustrine areas, such as in the south,
16 by the irregular surface and deranged drainage pattern,
17 caused partly by thick organic deposits. Small ponds dot
18 the area in the spring with the water level slowly
19 lowering during the summer season. In the central
20 and northern areas, lacustrine sediments generally
21 are better drained than those found further south.
22 On slopes, the rate and volume of surface runoff is
23 high during spring meltin and after intense rains
24 due to the poor permeability and high ice content of the
25 near-surface deposits.

26 Q Dr. Rutter, why do you
27 conclude that the east of the Franklin Route is to be
28 preferred to the proposed pipeline routes along the
29 Mackenzie River?

30 A Well, each of the possible

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1 pipeline corridors has certain advantages and dis-
2 advantages with respect to terrain considerations. The
3 big advantage of the routing east of the Mackenzie
4 and west of the Franklins, that is, the routes for the
5 proposed Arctic Gas and Foothills Pipeline, is the
6 proximity to the river and the proposed highway.
7 Construction costs will certainly be lower and
8 the access roads will be at a minimum. However, as I
9 stated, the terrain for the most part is poor, consisting
10 of ice-rich lacustrine silt and clay and bogland.
11 On the other hand, although logistical and economical
12 problems arise due to the distance from the Mackenzie
13 River, the routing east of the Franklin Mountains offer
14 the fewest terrain problems.

15 I concluded that, from a purely
16 terrain standpoint, the best routing in the northern
17 portion of the area would run east of the Franklin
18 Mountains.

19 Q Included in the area you
20 studied was the Ebbutt Hills.

21 A Mm-hmm.

22 Q And we have had some
23 discussion of the Ebbutt Hills and the I.B.P. site
24 there. In this area the proposed Arctic Gas Pipeline
25 would cross the Ebbutt Hills while the Foothills
26 Pipeline would go around them to the west. Would you
27 describe the terrain encountered in the Ebbutt Hills
28 region by the two different routes?

29 A The terrain that will be
30 encountered in the Ebbutt Hills area consists mostly

1 of till with patches of organic terrain. On the slope
2 reworked material (colluvium) is found. Other factors
3 being equal the steeper the slope the more potential
4 for erosion during and after construction. On the other
5 hand, the steeper slopes are well drained and are mostly
6 exposed to the south and therefore are likely to be
7 ice-free. In any case, it is my opinion that with
8 good engineering practice terrain damage could be con-
9 trolled on either of the two pipeline routes through the
10 area.

11 Q Dr. Rutter, as a result of
12 your experience with the E.S.P. Study and your more
13 recent work, would you indicate what further
14 research and study you feel is required?

15 A Well, I would recommend
16 that a broader corridor be examined for a
17 possible pipeline route and that such an examination in-
18 clude an investigation of a routing east of the Franklin
19 Mountains. From the terrain point of view, the
20 east of the Franklin route appears to have significant
21 favourable aspects and a preliminary evaluation of its
22 feasibility for a pipeline route could be conducted on
23 the basis of research and data presently available.
24 I would like to stress that that there is enough data
25 now for an, in my opinion, for an office study of
26 this. Now, if it proves out that further investigation
27 should be undertaken, then it could be, but a prelimin-
28 ary assessment could be made at the present time.

29 Well, when a final corridor
30 has been selected from the available data, future

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1 terrain investigation should concentrate in more detail,
2 on specific routing. This would include such investigation
3 as: exact distribution of permafrost and ground ice; rates
4 and other characteristics of surface runoff; performance
5 of materials from an engineering standpoint; detailed des-
6 cription, thickness and distribution of surficial
7 deposits and bedrock; location of aggregate; and
8 engineering characteristics, distribution, and mois-
9 ture content of organic terrain. In addition, more
10 information is needed on the characteristics of rivers,
11 streams and creeks, the thermal properties of materials
12 in permafrost areas, effects of fire and man-induced
13 thermal disturbance in permafrost materials, and
14 geomorphic process studies, particularly characteris-
15 tics and mode of origin of failure types.

16 MR. ANTHONY: Thank you,
17 Dr. Rutter. Would you now answer any questions that
18 any of the other counsel may wish to direct you.

19 MR. SCOTT: I think our order,
20 Mr. Commissioner, is to begin with, of those present
21 today, Messrs. Bayly and Bell and then to follow with
22 the two applicants and Commission Counsel.

23 THE COMMISSIONER: Just before
24 you start, Mr. Bell, just excuse me for one minute, to
25 make sure that I am oriented. Sorry, Mr. Bell, I
26 just wanted to satisfy something out of my own --

27 Arctic Gas, when they filed
28 their material with the Department of Indian Affairs
29 and Northern Development, and the National Energy
30 Board, referred to some alternate routes -- if I can

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1 find them -- and the alternate routes that they indicated
2 they had considered, Dr. Rutter, and I think were
3 the Fairbanks Route, the Fort Yukon Route, the Offshore
4 Route which didn't concern the Mackenzie Valley any-
5 way, the Mackenzie Valley Route, that is, on the
6 east side of the Valley, they had already rejected
7 the route on the west side of the Valley, the west
8 side of the river, but they did not consider -- tell me
9 if I am wrong about this -- as I understand it, Arctic
10 Gas did not consider a route east of the Franklins,
11 neither did Foothills. In other words, it appears
12 no consideration has been given to a route east
13 of the Franklins, is that right?

14 MR. MARSHALL: Yes, sir,
15 I think that is correct.

16 THE COMMISSIONER: They con-
17 sidered Fairbanks, the Fort Yukon and earlier they
18 had considered a route on the west side of the river.
19 They, of course, considered and finally opted for the
20 route on the east side of the river, but they never
21 did consider the route east of the Franklins. Do you
22 know why that should be so? Is there something that
23 is apparent to everyone in this room but me that would
24 account for the fact that they didn't think of going
25 to the other side of the Franklins?

26 A Well, it would be pure
27 speculation on my part, I have no details, but I
28 imagine that the -- I think it was just always that
29 the government had originally proposed that they
30 would like to develop the Mackenzie Valley and the

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1 companies went in there, it was close to the river,
2 it was a major transportation system, there is no
3 doubt about the river itself, it is a major trans-
4 portation route --

5 THE COMMISSIONER: And it
6 was a great advantage from an economic point of
7 view?

8 A Oh, it certainly would
9 be and then of course the announcement of the highway,
10 of course, this is fizzling out, evidently, but I
11 think it was this sort of considerations that the
12 company thought about, and some of the previous
13 work that had been done, of course, before the
14 consortiums got together were bore hole studies, this
15 sort of thing, terrain studies along the river
16 itself, and I think considering the transportation
17 route and the wishes of the Federal Government, I
18 think, this sort of thing.

19 THE COMMISSIONER: So the
20 cumulative --

21 A Yes, that's right, it
22 was just kind of, well, this is a course where it
23 is going to go. You know, I may be wrong.

24 THE COMMISSIONER: Right.

25 MR. MARSHALL: Sir, if you
26 wish I could comment on that very briefly, on some
27 of the factors as I understand them. The first would
28 construction costs connected with that the logistical
29 problems as Dr. Rutter has mentioned. The
30 Mackenzie River serves as a major transportation

1 artery. The route east of the Franklins would pose
2 considerable logistics problems and also the problems
3 would continue on through the operations and maintenance
4 period.
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1 The routes
2 away from established transportation arteries, there
3 would be environmental impact associated with the need
4 to construct access roads through or over the mountains
5 to get to this area, and I think also taken into account
6 any technical
7 was the consideration it was felt that/ problems associated
8 with construction through the terrain in the area
9 selected could be adequately dealt with. I'm not
10 sure about additional miles of route, but that probably
11 was not a factor.

12 MR. ANTHONY: Mr. Commissioner,
13 I'd like to at a later date, perhaps, refer you back
14 to the transcript reference which I thought I had with
15 me but I don't, where this matter was discussed. I
16 think when Mr. Dau was giving evidence I asked him
17 whether they considered east of Franklin, and did
18 the sort of an evaluation that Mr. Marshall now says
19 made them exclude consideration. I believe his
20 evidence was that they never considered that route
21 and therefore didn't do the sort of analysis that
22 Mr. Marshall now suggests was done. So perhaps we
23 can bring that to your attention too. We can see what
24 has happened in the interim between Mr. Dau's evidence
25 and Mr. Marshall, because his suggestion now is that
26 they did look at it.

27 THE COMMISSIONER: Well, Mr.
28 Marshall just did the analysis.

29 MR. ANTHONY: Well, that may
30 be the extent of the analysis.

MR. HOLLINGWORTH: Well, sir,

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1 I concur with Mr. Marshall's remarks and I think
2 maybe there is a difference in what is defined to be
3 an analysis. I think we've had discussions over and
4 over again by the engineers for both Arctic Gas and
5 Foothills as to whether they've considered something
6 and whether it's reduced to a report or not, and
7 perhaps Mr. Anthony thinks that Mr. Dau's evidence was
8 that there was no report, and probably that's correct,
9 and I think Mr. Marshall -- I'm just assuming this
10 might be going on what the engineers considered,
11 certainly that's the case from the Foothills' point
12 of view, and in large part these conclusions were
13 arrived at before the split-up by Alberta Gas Trunk Line
14 from the consortium.

15 Another point that Mr. Marshall
16 didn't raise is that the pipeline guidelines state that
17 the government is prepared to accept applications
18 down the Mackenzie corridor in the broad sense, and
19 not anywhere else.

20 THE COMMISSIONER: And not what?

21 MR. HOLLINGWORTH: And not
22 anywhere else, at least it's not mentioned anywhere
23 else.

24 THE COMMISSIONER: Yes, but the
25 guidelines -- forgive us, Dr. Rutter, if you don't mind
26 our pursuing this for a moment -- the guidelines don't
27 -- do the guidelines exclude the route east of the
28 Franklins? Do the guidelines indicate that that would
29 not fall within the corridor?

30 MR. HOLLINGWORTH: They don't.

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1 they speak of the Mackenzie corridor in the broad
2 sense. I've never really quite established what that
3 means, but I've always interpreted that myself, and
4 so have the staff of Foothills, to mean the area in
5 the Mackenzie Valley between the mountain ranges that
6 generally ring each side of the valley.

7 THE COMMISSIONER: Well, the
8 interesting thing -- I don't know if it's interesting,
9 but -- is that this map that Foothills or Arctic Gas
10 filed has these routes going through the Yukon and
11 one off-shore that everyone acknowledges is totally
12 impractical. The Yukon route, the Fort Yukon route,
13 which everyone seems to agree is totally impractical,
14 and they didn't even bother to put on the map this
15 route east of the Franklins, which -- I'm just
16 curious.

17 MR. SCOTT: The difficulty,
18 Mr. Commissioner, I think, simply is that the guideline
19 use the expression, "The Mackenzie Corridor," with a
20 capital "C", and don't define it. Now the applicants
21 have obviously, according to Mr. Hollingworth at least,
22 have provided their own definition of what's included
23 in that, and I presume that CARC takes a different
24 view and asserts that what was intended by the
25 expression, "The Mackenzie Corridor" is rather broader
26 than the areas between the two ranges of mountains.

27 THE COMMISSIONER: Sure, I
28 understand that, but you can have an alternate -- an
29 alternative that is outside the corridor. We've been
30 considering them.

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1 MR. SCOTT: Well, we were wonder-
2 ing about that, the applicants have, there's no doubt
3 about it.

4 MR. ANTHONY: Mr. Commissioner,
5 there's one more point. I think the evidence indicated
6 that the pipeline routes selected by Arctic Gas at
7 least -- I'm not in a position to comment on Foothills
8 -- but on the Arctic Gas application was selected before
9 the guidelines were issued, and the route and the
10 alternatives were studied from '69 to '71, and the
11 guidelines were issued in June of '72. That's, I
12 think, why the question of alternatives, and I think
13 a reading the guidelines it's suggested you're
14 supposed to look at various alternatives but they
15 will accept an application in the broad corridor. So
16 that's, I think, the reason why there were studies
17 of corridors obviously outside the particular guidelines
18 where an application would be accepted.

19 THE COMMISSIONER: Well, I've
20 never quite understood why it said, "We will accept
21 them within the corridor." But look at alternatives
22 outside the corridor.

23 MR. SCOTT: That time-table
24 that Mr. Anthony suggests, of course, and there's no
25 doubt it's accurate, rather comes against his submission
26 because that would be intrinsic evidence as to what
27 was intended by the phrase, "Mackenzie Corridor".
28 However, that's a matter perhaps for argument.

29 MR. MARSHALL: Sir, there
30 are various alternatives outside the corridor were

N.W. Rutter

Cross-Exam by Bell

Cross-Exam by Carter

1 Q But you're not suggesting
2 what those factors might be?

3 A That's out of my exper-
4 tise.

5 MR. BELL: Thank you. Those
6 are all the questions I have.

7 MR. BAYLY: I have no questions
8 of this witness.

9
10 CROSS-EXAMINATION BY MR. CARTER:

11 Q Sir, just following up
12 on our discussion of "corridor", I wonder, Dr. Rutter,
13 if you have any further information about this
14 corridor that the government talks about that you
15 could contribute?

16 A About my proposal on the
17 east side of the Franklins, or just in general?
18 Pardon me?

19 MR. SCOTT: I'm asking Mr.
20 Carter if his microphone is on, it's so hard to hear
21 him down here.

22 MR. CARTER: The reasons, or
23 one of the reasons I asked that, sir, is that in your
24 figure 2 you've outlined four areas and you'll see that
25 area 4 is considerably more narrow, particularly at
26 the north end, than the other areas, and I wondered
27 if that had some significance with respect to this
28 idea of the Mackenzie corridor?

29 A Yes, I can answer that.
30 As I said before, the areas were really chosen by me

N.W. Rutter
Cross-Exam by Carter

1 what to write about, and it was one of these situations
2 that you have so much time to write a report and you
3 map such a large area that you -- and the report had
4 to be submitted, and therefore I concentrated on areas
5 that were of the most interest to the industry and
6 government at the time. So therefore I drew these
7 arbitrary lines, concentrating where people had shown
8 an interest for future development. Does that
9 answer your question?

10 Q Well, it does in part.
11 Is this what you assumed to be the corridor as it
12 was referred to by the --

13 A I never, I never even
14 tried to define the corridor. I mapped 11 map sheets,
15 or we mapped 11 map sheets, we tried to map and to
16 assess the terrain in as wide an area as we could,
17 and then when it came to writing about it, because of
18 the time limitations, we -- I broke the area down to
19 the area that was of most immediate concern to industry
20 and government. I did not define a corridor
21 myself, if that is what you mean.

22 Q I see, O.K. Have you
23 indicated the -- I couldn't see from here -- the
24 east of Franklin route on that map?

25 A The small scale or the
26 large scale map over here. It's partially on there
27 but it's just -- I'm not sure, in a general way I placed
28 it on that map.

29

30

1 I would have to look at it a
2 lot more carefully to give the exact spot I mean, or
3 the best route in my opinion, but in a general way
4 it is on that map, yes.

5 Q Now, do I take it that
6 the area where it diverges is roughly in the Willowlake
7 area?

8 A Yes, in the southerly
9 part, it is Willowlake River in the southern part.
10 But you can actually connect up with the proposed --
11 east of the Franklins, by several adequate routes
12 to the south of the Willowlake River. In other words,
13 it doesn't make much difference where you diverge
14 from south of the river. In other words, there are
15 several areas where you could enter the end of that
16 area with.

17 Q From a terrain point of
18 view.

19 A Purely terrain point of
20 view, yes.

21 Q It doesn't really matter
22 south of --

23 A Well, it matters, but
24 there are many alternatives, right. Yes --?

25 THE COMMISSIONER: Excuse me,
26 are you tracing this --

27 MR. SCOTT: I think Dr. Rutter
28 with the assistance of Dr. Hughes and Dr. Fyles red
29 pencil, has dotted in in a rough way the deviation
30 that -- I shouldn't say the deviation, but the route that

N.W. Rutter
Cross-Exam by Carter

1 he proposes, there it deviates from the revision
2 that he proposes, where it deviates from the route
3 that Arctic Gas and Foothills have selected.

4 A Could I take it from
5 there?

6 MR. SCOTT: You will have to
7 speak loudly. Okay, let's go back then to the
8 south of the Willowlake River. The original proposal
9 was to move up in this area.

10 Now CAGSL has changed
11 their application and they now have a crossing east
12 of the Franklin Mountains, so therefore -- pardon me,
13 east of Fort Simpson, and therefore the routing is has
14 changed in here so when you get into the area of the
15 Willowlake River and you want to divert east of the
16 Franklin Mountains, you can come in from this
17 angle, or you can come in from the south. I just
18 haven't bothered to extend that south of the Willowlake
19 River because my main objective here is to propose
20 a route north of the Willowlake River, east of the --
21 you might say the end of the Franklin Mountains, and
22 this routing here.

23 So really what I am saying
24 is I think your question was how you enter the area--
25 well, because there have been changes, which this
26 is adequate one and coming in from the south
27 is fine too, but you just have to be careful of
28 what you find right in this area, but there are
29 plenty of alternatives. But really what I am talking
30 about here, my major concern is this.

1 Does that answer your question?

2 THE COMMISSIONER: Yes, well,
3 do you mind tracing your route northward from where that
4 red pencil ends?

5 A Okay, well, this is it.
6 I am only talking about the area that was covered in
7 our investigation. I am only really talking about,
8 well, you can -- in the report you will find our
9 suggestions for alternative routes in the southern part
10 but really what I am talking about is from 60 to 64,
11 specifically here, just this area of about 100 miles
12 or so in here, that is the only part that I have
13 studied in detail.

14 THE COMMISSIONER: Well, you
15 don't take responsibility for north of Area IV, is
16 that it?

17 A No, I do not, no.
18 I have not been in the field north of Area IV and
19 my judgment is based on accompanying people in the
20 field in that area, parts of it looked very good
21 because of this fluting and drumlinoid situation
22 and parts I just can't comment on at all.

23 MR. CARTER: O And that is
24 roughly in the area of the Blackwater River?

25 A Yes, it is.
26 Yes, south of Blackwater River down to the Willowlake
27 River.

28 O I take it from what you
29 have said that you have no real problem from a terrain
30 point of view with Arctic Gas's routes south of the

1 Willowlake River.

2 A South of the Willowlake
3 River. Well, generally no. Certainly you can pinpoint
4 it probably in a better area, but it is not too bad,
5 is my opinion.

6 Q Could you indicate to us
7 in terms of map sheets then how much area this takes
8 up, the area that you are referring to from the
9 Willowlake River to the Blackwater River?

10 A You can refer to
11 figure one, we talk about map sheets, generally
12 speaking, the northern part of 95-J and 95-O.

13 Q All right.

14 A We are just talking about,
15 we're actually a small portion, a hundred miles, sort
16 of dimension.

17 Q So it would be roughly one
18 and a half map sheets out of these eleven?

19 A Close, yes.

20 Q I take it that you leave
21 the east of the Franklins' routing north of the
22 Blackwater River to others who have concentrated their
23 studies in that area?

24 A Yes.

25 THE COMMISSIONER: Well, are
26 you saying that what you have seen so far in your
27 investigation of the route east of the Franklins, as
28 far north as the Blackwater River, justifies similarly
29 intensive investigation of the route east of the
30 Franklins, north of the Blackwater River. The Franklins

N.W. Rutter
Cross-Exam by Carter

1 extend for hundreds of miles north of that, don't
2 they?

3 A Yes, they do. Well, as
4 I mentioned in my testimony, a preliminary evaluation
5 could be made of this at the present time. I think
6 that it could be quickly identified if it is worth
7 pursuing, but I think that it should be done, yes.
8 Could I add to this that I think the contrast between
9 the deposits you find in an east-west direction, the
10 lacustrine sediments, high ice content lacustrine
11 sediments in the area of Wrigley and this area, then
12 if you go directly to the east, east of the Franklins,
13 the terrain conditions change quite considerably and
14 therefore there is no doubt in my mind that that is
15 from a terrain point of view entirely. It is more
16 desirable from a construction point of view. Now,
17 with this contrast as great as you go north, this
18 would have to be evaluated, but I think that it would
19 be done with very little field work.

20 THE COMMISSIONER: Well, you
21 are saying that the route east of the Franklins
22 so far as you have investigated it, that is, to the
23 Blackwater River, has a much lower incidence of ice-
24 rich permafrost than the route the pipeline companies
25 have chosen, that is the key thing --

26 A In general terms, yes,
27 that is right.

28 THE COMMISSIONER: That is the
29 vital thing, I take it.

30 A I would say so.

N.W. Rutter
Cross-Exam by Carter

1 MR. CARTER: Q I take it
2 that what you are saying, Dr. Rutter, is that a
3 considerable amount of further study would have to
4 be done.

5 A North of the area or --?

6 Q Yes.

7 A I would say, the way
8 I would pursue this, ^{there} is enough information available
9 from enough people, enough reports available and
10 air photos, interpretation could be done in the
11 office. You could come out with a general idea that
12 is worth pursuing in detail later. Maybe something
13 like crossing the Franklin to the north and moving
14 it back towards the river may be an economically
15 or terrain, from the terrain point of view undesirable
16 and therefore the study may not be pursued any further
17 in detail. A I think that the present time I
18 think you could make an evaluation with very little
19 field cost to find out if it is worth making detailed
20 investigations north of the area that I talked about.
21 That is what I am saying.

22 THE COMMISSIONER: You are
23 saying that if the present data were examined, it might
24 be found that the advantages from a terrain point of
25 view were so great that it was worth examining the
26 route from the social and economic and financial and
27 so forth and so on point of view?

28 A I would say so.

29 THE COMMISSIONER: Carry on.

30 MR. CARTER: Have you discussed

N.W. Rutter
Cross-Exam by Carter

1 the route further north with the people that have done
2 the work in that area?

3 A I thought this might
4 come up. Yes, I have several -- three or four years
5 ago we discussed it with colleagues at the
6 Geological Survey, but as far as conclusions, any
7 conclusions reached, as I remember it, we really
8 reached no conclusions.

9 MR. SCOTT: Mr. Commissioner,
10 I don't want to suggest that this is a set-up, I think
11 it would be helpful to know, and I think I can do it
12 simply by statement, what precisely happened here.

13 As Dr. Rutter has said, he
14 was commissioned by the government to do mapping
15 and if you look at figure 1 you will see the mapping
16 checked in that he did in what is called the southern
17 area.

18 Dr. Hughes, who you heard
19 yesterday, was retained or asked to prepare a separate
20 report on the mapping of the central area, and Dr.
21 Ramsey who is also here, sitting not far from Mr.
22 Carter, was instructed to prepare a report on the north-
23 ern area. So what we have in essence is three reports
24 that look like this, one of which is Dr. Rutter's
25 responsibility, and I presume Mr. Carter's question is:

26 "Have you discussed this proposal with the
27 person who prepared the reports that cover the
28 central and northern areas?"

29 Is that it, Mr. Carter?

30 MR. CARTER: Yes, well I think
the reason for asking it is that the route all of a

N.W. Rutter
Cross-Exam by Carter

1 sudden stops at about the Blackwater River and it would
2 seem kind of crazy not to discuss it with people further
3 north, to see what happens after that.

4 MR. SCOTT: Well, Mr. Anthony
5 got us in behind those mountains. He no doubt will
6 get us out.

7 MR. ANTHONY: I'm sure, Mr.
8 Scott, that you will be safely returned from the Macken-
9 zie River. I may say that the presentation of Dr. Rut-
10 ter based on his studies of the northern portion -- and
11 I think I can explain quite readily why Dr. Rampton
12 was unable to appear to give us any further discussion.
13 Farther north I am hopeful perhaps Mr. Carter will en-
14 courage Dr. Rampton to discuss the issues with which he
15 is concerned on the northern portion. But we will be
16 leading evidence later on on the northern portions.

17 MR. SCOTT: But you are not
18 suggesting that Dr. Rutter's evidence is supportive of
19 the proposal that Dr. Roed will be making subsequently,
20 are you?

21 MR. ANTHONY: Dr. Rutter is
22 here to explain the studies he conducted and the con-
23 clusions he came to in the areas he studied. Dr. Roed
24 will be discussing the further work that he has done
25 on examining the work of all three of these gentlemen
26 and other works and will be giving his views of what
27 he feels.

28 A Could I make one state-
29 ment here? I think it is important to note that these
30 reports, it would be nice to put them into a package

N.W. Rutter
Cross-Exam by Carter

1 and say, "Well, all right, we studied that area and
2 therefore we are thinking along these lines and we will
3 put out a nice coherent report for the three areas."

4 But the Geological Survey
5 doesn't work that way. You, as an independent resea-
6 rcher, you write your report and certainly they edit
7 it, and they will tell what is wrong with it; but cer-
8 tainly it is the responsibility of the science in
9 charge of the project to come up and present the data
10 the way he wants to with certain guidelines, and
11 there is no reason in the world why there should be any
12 similarity between the conclusions drawn in the three
13 areas.

14 I think this is important to
15 bring up.

16 THE COMMISSIONER: Well, let's
17 stop for coffee.

18 (PROCEEDINGS ADJOURNED FOR FEW MINUTES)
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N.W. Rutter
Cross-Exam by Carter

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)
MR. ANTHONY: Mr. Commissioner

I wonder if we could proceed with further questioning, we could take the benefit of the consultations that have gone on. As Mr. Scott pointed out, the work immediately north was conducted by Dr. Hughes, who was here, and I believe there are some comments that Dr. Rutter would like to make.

MR. CARTER: I think we should probably have them, but it would have been better had they been done before cross-examination commenced.

MR. SCOTT: Before that, Mr. Commissioner, Dr. Rutter's geological colleagues have told me that he will be very uncomfortable if he's unable to smoke a cigar. I would like to, if you permit, indicate that it's quite all right if he does so. Others have pointed that out.

A I have complete control over it, so I don't really need to.

MR. CARTER: Commission counsel is again trying to set up the witness.

THE COMMISSIONER: Well, if you wish to smoke, don't worry, I understand.

MR. SCOTT: It's something you can't do at the National Energy Board.

A That's right.

Now what I'd like, if I may say at this point, is that before this report was written, before I started proposing a route east of the Franklins, I talked to colleagues about the possibility

N.W. Rutter
Cross-Exam by Carter

1 of moving it north. In other words, why write about it?
2 There is
3 no possibility further north, and we talked to my
4 colleagues about that, mainly Dr. Hughes who mapped
5 to the north; but at the time we were discussing this,
6 there had been no mapping that far east of the Frank-
7 lins to the north. In other words, you have the maps
8 to the south cover a considerable portion, and then
9 you didn't have the mapping completed to the east
10 north of my area, so we couldn't say too much except
11 for the fact that we were looking at, you know, a
12 general -- looked at air photographs in a general way,
13 mosaics or what have you, that it appeared that these
14 flutings and drumminoid ridges did extend further north
15 and we marked out a general route on a small scale map,
16 and we all agreed, that yes, it looks fairly good and
17 perhaps it should be investigated further.

18 Now since that time, there
19 have been maps completed, and at the present time if
20 you look at figure 2, I think maybe Dr. Fyles --
21 pardon me, figure 1, Dr. Fyles might have made a
22 notation on your figure 1 that there's a map area
23 106-P, which is east of 106-O, has been completed and
24 is on open file now through the offices of the Geo-
25 logical Survey, and also east of 96-E, 96-F is now
26 completed, and the north-east part of 96-E is completed
27 now. So these maps are on open file. They could be
28 studied and the feasibility of extending the route
29 further north could be made in a preliminary matter.

30 Now the only part that would
include east of the Franklins that I am supporting

N.W. Rutter
Cross-Exam by Carter

1 would be that map sheet 106-I, east of 106-I has not
2 been completed, and unfortunately that is rather a
3 critical area that may have an influence if a route
4 of this nature was chosen in that it is where you
5 might want to enter a river valley again near Fort
6 Good Hope. But as far as the terrain just north of
7 the area, things look fairly good. You have this
8 drumminoid features, and there's a possibility of
9 extending it north.

10 THE COMMISSIONER: Thank you.

11 Go ahead, Mr. Carter.

12 MR. CARTER: Yes.

13 Q Dr. Rutter, when did you
14 become aware that these further maps had been completed?

15 A About five minutes ago.

16 Q I see.

17 A But I've been well aware
18 that they've been in preparation. I did not know they
19 were available at the present time.

20 Q Now, the general route
21 that you say was marked out on a map earlier on, where
22 did it come back to the Arctic Gas route?

23 A You mean north of the
24 area I'm proposing?

25 Q That's right.

26 A We talked about the
27 possibility of coming back near the Fort Good Hope
28 area, and that's all. I just can't comment beyond to
29 the area immediately north, maybe 100-150 miles, where
30 we discussed it we said, "Yes, look at the flutings,"

N.W. Rutter
Cross-Exam by Carter

1 you could easily see them, and therefore there was a
2 good possibility that the route could be successfully
3 moved to the north.

4 Now where you come out, the
5 southernmost point we commented on was the Fort Good
6 Hope area. It could also continue north and then
7 perhaps come out some place further north. But I just
8 can't comment on that.

9 Q In your evidence, sir,
10 you referred to the four areas in figure 2 that your
11 work had been concentrated in, but you did say that
12 you felt you could extrapolate from these. Is that
13 correct?

14 A Yes, I could extrapolate
15 from the area we'd already mapped into the areas --
16 into the area. Now this was mainly done to complete
17 the picture, that if somebody wanted to talk about some
18 area -- some region outside one of the areas because
19 of the similarity of the terrain that you could comment
20 on it mainly because it had been mapped. It just wasn't
21 included in detail in the report.

N.W. Rutter
In Chief

1 Q This extrapolation
2 that you said was possible, would that be in a
3 northerly direction as well as in an east west direction?

4 A No, because, it would be an
5 east-west direction generally speaking because of the
6 similarity of the terrain east and west. But on the
7 same token when you are talking about flutings and
8 drumlins, the flutings and drumlins are easily
9 identified and therefore you could certainly, going
10 from the area for east of the Franklins, into the
11 area to the north, you could extrapolate from there
12 too. It is not a very -- some types of the terrain
13 you could extrapolate to the north, it isn't very
14 difficult to follow a fluting or a drumlin into
15 another area, if you can see it on air photographs and
16 be pretty certain of the type of terrain which underlies
17 the structure.

18 Q Now, I take it that
19 your thesis, if I can call it that, is that to the
20 east of the Franklins could very well be better
21 because you are going to encounter less ice content
22 in the terrain, is that fair to say?

23 A This is one aspect of
24 it, yes.

25 Q Is it the major aspect?

26 A It is a major considera-
27 tion, yes.

28 Q Now, if the pipeline
29 that's being considered for your route selection,
30 when you are looking at this east of the Franklins, is

1 a chilled gas pipeline , is that such an important
2 consideration?

3 A If it is a chilled
4 gas pipeline?

5 Q Yes.

6 A If it is a chilled
7 gas line -- the chilled gas line as such, I am not
8 too worried about once it is buried, but it is during
9 the construction and perhaps some delays that you
10 may have that subsidence and erosion could take
11 place, once it is in the ground and it is frozen,
12 certainly in an area of continuous permafrost, I am
13 not too worried, but certainly in a discontinuous
14 area this could be a major problem.

15 Q I see. So, --

16 A Excuse me, were you
17 talking about east of the Franklin Mountains or
18 were you talking about the terrain next to the
19 river in that last question. I am sorry, I am just
20 backing up a little.

21 Q East of the Franklins.
22 Yes, I was talking about east of the Franklins.

23 A Okay, from a terrain point of
24 view, putting a chilled pipeline in that particular
25 type of terrain would be superior to west of the
26 Franklin Mountains.

27 Q Right, my question was
28 and I think you have answered it, is if the reason
29 for going east of the Franklins was to avoid ice
30 content --

N.W. Rutter
In Chief

A Okay.

Q --is that so with a chilled gas pipeline and you said, you have given your answer.

Now, dealing with the ice content in the terrain, the ice content in the terrain east of the Franklins, is that something that you have determined by drill hole data or in some other manner?

A Okay, as far as the once again I had to compare the two areas. When you are talking about the lacustrine silts with a high ice content, certainly we have drill data available, we also did our own drilling. Okay, so we know the ice content is high in the deposits near Wrigley and in the glacial lacustrine west side of the Franklin. Now, on the east side of the Franklin Mountains, no, we don't have any drilling available, but because they are drumlins, and because we inspected outcrops in drumlins in nearby areas as well as been able to see exposed portions of the drumlins and flutings, that we can conclude that in the crest part or certainly in the well drained part of these drumlins is less ice than you would find in the glacial lacustrine deposits on the west side of the Franklin Mountains.

Q And I take it that you are now talking about your area, if I can call it that which would be south of the Blackwater River?

A Mm-hmm.

1 the areas and I continued my own idea of a routing
2 into each area and so when I leave one area I comment
3 certainly on the area to where it is entering, in
4 other words, in my three areas if I had one route
5 in one place I have to continue that north and
6 choose the best routing there as you can imagine.

7 Q Yes.

8 A Well, when you get into
9 Area IV I have to lead in to this part that I have
10 explained east of the Franklins, so the routing
11 divides, here, all there is, is just to simply
12 explain that there is a depression where you have
13 active thermokarsting taking place and we can
14 go on either side of that for a short distance. We
15 are just talking about -- I am not sure, but we
16 are talking about in a ten mile range, this sort of
17 thing and so therefore, it comes back together and
18 then you continue east to the Franklins.

19 Q I see, what evidence
20 do you have that leads you to the conclusion that
21 thermokarst subsidence here is in fact active?

22 A Okay, the active
23 thermokarst, the evidence for this is that in the
24 peat bogs and so forth, the freshly exposed, and there
25 are trees that are subsiding into the water and
26 areas that had not previously been flooded are
27 flooded and there are dead trees and dead vegetation
28 in the area, and it is one of these situations
29 that you can go to the, -- go on the ground to a
30 thermokarst subsiding area and actually during the

N.W. Rutter
In Chief

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1 summer you can see the erosion and the weathering
2 taking place, the melting taking place.

3 Q Now, you refer to
4 what I believe you call meltwater channels.

5 A Yes.

6 Q And these are on the
7 east side of the Franklins, but you believe that
8 they will be no real problem and I am wondering
9 about spring runoff. Do you know how much runoff
10 might be carried in these channels?
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N.W. Rutter
Cross-Exam by Carter

1 A There is a reason for
2 this, because meltwater channels can -- they can
3 control the position of a meltwater channel is controlled
4 by the
5 /position of the ice, and it may or may not be in the
6 post-glacial drainage directions. Therefore you
7 could collect water in them, you could completely
8 avoid them, or they can be used of paths of recent
9 or modern drainage routes. But each one would have
10 to be looked at individually to determine this.

11 Q Just let me be clear
12 on this. Are you stating you could route the line so
13 as to avoid crossing these?

14 A No, in my opinion each
15 one would have to be looked at, but you could certainly
16 route a pipeline across or along a meltwater channel.

17 Q Yes.

18 A Now each one would have
19 to be looked at. Some might be less desirable than
20 others. My only point in making that statement was
21 generally speaking, meltwater channels can be wide
22 but with fairly low banks because of the high volume
23 of water that erodes an area in a very short period of
24 time, and most meltwater channels can be quite wide,
25 but the banks have a low local relief compared to
26 post-glacial rivers, major river systems whose banks
27 may be quite a bit higher.

28 Q How high would the banks
29 be?

30 A It can vary, depending
 the position of the ice how much volume of water and

N.W. Rutter
CrossExam by Carter

1 the type of terrain that's eroded; but they can vary
2 from three or four feet to several hundred feet. The
3 ones I'm talking about in this area are relative to
4 the river, the major river systems are the relief is
5 generally less. When I say "relief" I mean the bank
6 really.

7 Q And I take it that you
8 see no problem there in spite of the fact that you
9 don't really have as much detail as you'd like on runoff
10 and that sort of thing.

11 A As a group of features,
12 there's less problem as a group, now there's less
13 problems with meltwater channels than there would be
14 other glacial features in the area, but each one would
15 have to be evaluated independently. But generally
16 speaking, what I've looked at, don't offer too much
17 of a problem, in my opinion.

18 Q Do you have -- how much
19 drill-hole data do you have on the east of the Franklins

20 A None. Pardon me, I'm
21 sorry, I have to back that up. We do have some journal
22 data in the bog that we drilled ourselves in the --
23 by another party that worked with us during the second
24 summer. There is three or four holes that have been
25 drilled through bog into the underlying material, but
26 I was thinking you were referring to the actual material
27 -- the surficial geological material; but we do have
28 some holes in the bog areas up to about 15 feet or
29 something of this nature.

30 Q But none in the drumlins.

A No, we do not.

N.W. Rutter
Cross-Exam by Carter

1 Q Now, dealing with the
2 bogland, as you've called it, and I think this is on
3 page 5 of your evidence, I wonder if you could indicate
4 where that is located on the map?

5 A Well, the bogland is,
6 to a certain extent, extends in many areas in certain
7 quantities east of the Franklins. Now as far as total
8 area east of the Franklins, take the volume of the
9 total area, there is less in this particular area
10 just because of the features found, then you'd find in
11 the area west of the Franklins, and when I say this
12 you can avoid it more easily east of the Franklins
13 than you could to the west because of the narrowness
14 of the belt and you find west of the Franklins, east
15 of the Mackenzie River. Now I happen to have a 1 to
16 a million scale map here of the area that -- it's
17 a Geological Survey open file report -- that could be
18 examined or we could look at, and I could show you
19 what I mean by that.

20 Q But it's bogland --

21 A It's discontinuous and
22 in patches, yes.

23 Q Would it be possible, in
24 your view, to avoid it altogether?

25 A No, not altogether, no.
26 Unless from an economic point of view you can design
27 a pipeline into any shape you wanted at any time.

28 Q Well, without being --

29 A Ridiculous? No.
30

N.W. Rutter
CrossExam by Carter

1 THE COMMISSIONER: Dr. Rutter,
2 you were employed by the National Energy Board in
3 '74 and '75 as an environmental advisor.

4 A Yes sir.

5 Q Did you have anything to
6 do with the supplying of information to the Board
7 regarding routes for the proposed pipeline?

8 A Absolutely none. If you'd
9 like me to elaborate on that, what I'm presenting here
10 was done on the auspices of the Geological Survey in
11 the northern program and my position was a research
12 position. I did this work, it was published, and then
13 later I went to the National Energy Board and the job
14 was completely different, no research involved at all.
15 As you are well aware, you evaluate an application that
16 comes before the Board. Does that answer you?

17 THE COMMISSIONER: Yes, thank
18 you.

19 MR. CARTER: Q One of the
20 other points that you made, sir, in comparing the
21 route on each side of the Franklins, was that the
22 drumlins on the west side contained some huge boulders
23 that could be a problem. I'm wondering if you know
24 whether or not the drumlins on the other side of the
25 Franklins might not contain boulders as well?

26 A I think they will, but I
27 think in my opinion they will certainly be less, because
28 on the west side of the Franklins the direction of ice
29 movement is such that I think what you've done, you've
30 incorporated, as the ice moved from the east to the west

N.W. Rutter
Cross-Exam by Carter

1 and variations of that, and you picked up large
2 boulders of bedrock from the Franklin Mountains, and
3 deposited in the drumlins on that side, and as you
4 go east of the Franklins there's a good possibility
5 that you don't have the large boulders because by that
6 -- in that area they haven't -- the ice has not
7 crossed the Franklin Mountains itself.

8 Now true, you could be bringing large boulders in
9 from the Canadian Shield to -- further to the east,
10 but I would say that to reiterate, that west of the
11 Franklin Mountains would have a better chance of
12 incorporating larger material because of the proximity
13 of the Franklin Mountains themselves, when considering the
14 direction of ice movement. I've seen them and they
15 are formidable, but I think it would be less of a
16 problem to the east.

N W. Rutter
Cross-Exam by Carter

1 Q You couldn't be sure with-
2 out those reports though?

3 A No.

4 Q Now, in your report in
5 the environmental social program, there , as I recall,
6 was a considerable amount of drill-hole data. I take
7 it that was all west of the Franklins.

8 A I don't think we had a
9 -- there, was a map included in where the -- yes, on
10 the maps in the report there are locations where
11 the bore-holes and where the information is derived
12 from. That was in the report.

13 If you look -- as you can see,
14 I mentioned you've all got a picture, you can have
15 that in front of you, you can see all those holes,
16 if you refer to the text you'll see that those are
17 ours, but those lines across the area are a summation
18 of geophysical data that was available, so we've
19 included that in our description. So it isn't all
20 field, we do have some data that was from other sources.

21 So you have the location.

22 The description of
23 those areas and bore holes and geophysical data, you'll
24 find in the appendix or at the back of the report.

25 Q The drill hole data
26 is pretty well all concentrated on the west side, is
27 that fair to say, from the map?

28 A Well yes, it is.

29 Q And these geophysical logs
30 do they tell you anything about ice content?

N.W. Rutter

Cross-Exam by Carter

A Some do and some don't.

Q You, I take it, feel

A You're emphasizing the

THE COMMISSIONER: On the

A On the east side. There's

N.W. Rutter
Cross-Exam by Carter

1 great deal—Blackwater River area is a great
2 deal of sand, and well-drained sand and gravel and
3 this sort of thing. Just generally speaking, from
4 a preliminary point of view, a preliminary analysis
5 in the field work we've presented, you can take all
6 these factors and come up and make the statement
7 from the terrain point of view, yes, this appears to
8 be more desirable. So you're really stressing the
9 ice content but yes, you're right, there's less ice
10 content, which is a factor contributing to it.

11 MR. CARTER: Q The other
12 matters, I think drainage you mentioned?

13 A M-hm.

14 Q These are factors that
15 favor the route, but again you're talking about your
16 area between roughly Willowlake River and the Blackwater
17 River.

18 A Yes, the area we're
19 talking about, and I continue this same reasoning
20 all the way down to latitude 60, which you could find
21 in the report, but what we're talking about now, yes.

22 Q The drainage, I take it,
23 is associated with the drumlin feature that you get
24 better drainage?

25 A That certainly influences
26 it, yes.

27 Q Would there not be
28 areas that you'd have to traverse between the drumlins,
29 for example, where you encounter higher ice content
30 and drainage problems?

A Yes. I think if you

N.W. Rutter
Cross-Exam by Carter

1 follow north-west, some of the crests of these drumlins
2 which are -- which have considerable length, that there
3 is a possibility you could avoid many of these crossings
4 just by keeping parallel to them. If you go to the
5 north side of say, Fish Lake, O.K., the southern part
6 of the area, and then place your pipeline on the crest
7 areas parallelling the structure, then you could
8 probably -- you could avoid many of these crossings.
9 As you go north you will find areas that some of these
10 drumlins are even a greater length than the ones in
11 the area that we mapped.

12 But to answer your question,
13 yes, you'll have problems, you'll have to go from
14 one to the other, and by the same token there is a
15 considerable length along the crest that is more
16 desirable on the average than some other areas.

17 Q Have you had an opportunity
18 to review Dr. Roed's proposal?

19 A In a very general way.

20 Q Have you any comment
21 on that?

22 A Not at this point.

23 Q Is your east of the
24 Franklin route the same as his, or different?

25 A He appears to -- well, I
26 think he does go further east than I proposed, yes.
27 But I think one of his strong arguments will be that
28 the terrain is very similar to what I'm proposing here.

29 Q And as you've emphasized
30

N.W. Rutter
Cross-Exam by Carter

1 you have just looked at it from a terrain point of
2 view. There are other factors to be considered.

3 A Totally.

4 Q If you take all the other
5 factors into consideration, and assume that from a
6 terrain standpoint east of Franklins is better, but
7 the other factors such as logistics, and environmental
8 concerns going into a relatively undisturbed area
9 that
10 rather than along the valley/has had some disturbance,
11 the problem of access roads and what-not, even assuming
12 that the terrain is better but that these other factors
13 lead you to the decision that you ought to stay on the
14 west side, do you have any reason for saying that the
15 pipeline could not be built on the west side of the
16 Franklin Mountains?

17 A No, that's a difficult
18 question, as you are well aware.

19 MR. ANTHONY: I wonder if
20 Mr. Carter would assist, Dr. Rutter's made it clear
21 that he's able to give evidence on the terrain consider-
22 ations and not on the environmental and cost consider-
23 ations. Whether it would be fair to limit the question,
24 if he wants to ask his opinion of routing west to the
25 terrain issues, that Dr. Rutter is able to comment on?

26 MR. CARTER: I think I have,
27 sir.

28 MR. ANTHONY: Sorry, do I
29 understand --

30 A Excuse me, I think what
you're leading, or the answer you want, even though

N.W. Rutter
Cross-Exam by Carter
Cross-Exam by Hollingworth

1 this may be a good route, couldn't we somehow build it
2 on the east-west side, isn't that right, I mean from
3 a --

4 MR. CARTER: If the other
5 factors, I'm not asking you to discuss those.
6 But if they led you to the decision that you should
7 be on the west side, from a terrain point of view, is
8 there any reason why it couldn't be built on the west
9 side?

10 A At this stage and what
11 I know from my own experience, I'm not so sure I can
12 answer that. I don't know.

13 MR. CARTER: I have no further
14 questions, sir.

15 THE COMMISSIONER: Mr. Holling-
16 worth?

17
18 CROSS-EXAMINATION BY MR. HOLLINGWORTH:

19 Q Mr. Rutter, how many drill-
20 holes did you say your party drilled on the east of
21 the Franklins?

22 A I'd have to count them.
23 They're in the report.

24 Q Do you have a rough idea
25 without going to that trouble?

26 A Well, we're talking about
27 -- we're talking on the order of about less than a
28 dozen, I'd say.
29
30

1 Q And what exactly was the
2 nature of the studies which were carried on in the
3 field apart from these dozen drill holes?

4 A Okay, the way the
5 project was approached, was airphoto interpretation,
6 extensive air photo interpretation and then field
7 checking of the surficial deposits and the landforms
8 in the area by helicopter support. In this particular
9 area we were talking about there was a base camp
10 at Wrigley and we operated out of a field camp there
11 and we ground checked, but the thing that hasn't been
12 emphasized is that at the party at Wrigley, there
13 were at least 29 people at one time and there were
14 a group of scientists from the University of British
15 Columbia who investigated, in detail, some of the units
16 that we had mapped. When I say in detail I mean they
17 gave an idea of the soil and the vegetation soil
18 relationship, the texture and this sort of thing.

19 As well as that we had
20 other scientists from the Department of Agriculture
21 working on the peat plateaus and this sort of thing.
22 So there were extensive ground checking by many
23 different scientists, as I say there were as many
24 as 29 people in the party at one time, but all
25 those investigations by these, say, 29 people would
26 take place over only on about a three to four week
27 period within a map area, but it was intensive
28 for the time that it lasted and we had of course
29 helicopters, where we had as many as three helicopters
30 at one time.

1 Q On page three of your
2 prepared evidence you state about two-thirds of the
3 wya down the page, "North of Willowlake River perma-
4 frost and ground ice become much more widely
5 distributed and permafrost is present not only in
6 bogland areas,"etc.

7 Do you mean by that statement
8 that there is more permafrost, when you say more
9 widely distributed, I wasn't quite sure whether you
10 meant there was more permafrost present or whether
11 it was scattered more north of Willowlake.

12 A North of Willowlake
13 River -- I am talking about now -- I think in this
14 particular context -- well, to take the terrain along
15 the east side of the river itself and the west side
16 of the mountains, as you go north the deposits are
17 such, and the vegetation is such that you have
18 a higher degree of permafrost that can be identified
19 and the way it can be identified is by the ice
20 content below the active layer. So it appears that
21 there is an increase in permafrost distribution just
22 by the fact that you can recognize it. You do get into
23 this problem of the warm permafrost, the material
24 that is about 32° or 0° that you don't really, unless
25 you have ice content to identify, you don't really
26 know if it is frozen or not.

27 Q So you are saying that
28 there is more permafrost north of Willowlake River?

29 A Yes.

30 Q Okay, I just wanted to

1 clarify that.

2 On page four in answer to
3 the first question you state in the second line of
4 your answer or the second sentence of your answer:
5 "The only place that falls outside the broad corridor
6 of interest to government and industry is in the
7 north where the most acceptable pipeline and route
8 runs east of the Franklin Mountains." Now, I just
9 want to clarify that opinion is again restricted to
10 terrain conditions only, is it?

11 A Yes, sir

12 Q Then in the answer to
13 the next question you say, the best routing based on
14 terrain considerations is east of the Franklin
15 Mountains. Have you had cause to consider whether
16 it is a better route from any other point of view
17 at all?

18 A Just on commenting on
19 the -- in this particular -- the areas that I
20 mapped, so I am only commenting on the area I mapped
21 which you can see on figure one.

22 Q Then on page five in
23 the first complete paragraph -- I am sorry, I have
24 got the wrong reference there. On page two of your
25 evidence, you say that the characteristics of each
26 of these areas is similar to the adjacent areas to the
27 east and west so it is possible to extrapolate
28 the discussion of one area to another.

29 I am sorry, that is on page
30 one, that is the beginning of your evidence. It is in

1 answer to the second question.

2 NOW, I am still not sure that
3 I am clear on what you mean by that. Do you mean to
4 say that the areas east and west of the areas which
5 you have outlined on figure two are similar to the
6 areas within the areas that you mapped?

7 A Yes, I think that I
8 should explain that. In general, yes. Now, having
9 mapped the entire area which you can see on
10 figure one, and this was broken down in order to
11 complete the report that was requested on short
12 notice. I broke the area down into the
13 area one, area two and area three and area four
14 for convenience and therefore, and the reason I
15 chose them the way I did was because this was where
16 a lot of the activity, a lot of the drill hole informa-
17 tion was available and where people had shown an
18 interest. When I say people I am talking about
19 government and industry and therefore just to give
20 the reader the idea that if I discuss Area I and I
21 think I was more specific in each area that I
22 was talking about, that you could jump east or
23 west of that area and in the area I mapped it
24 was similar terrain.

25 NOW, of course there is a variation
26 of that as you go north, when you jump out of
27 Area IV in the northern part, of course, the
28 terrain changes characteristics, but I pointed that
29 out in the report. So all it is, really, what I am
30 saying is that, yes, I am discussing Area I, II, III and

R.W. Rutter
Cross-Exam by Hollingworth

1 IV but because I have mapped east and west of there,
2 what I say about Area I may be close to what you
3 find east and west of it, do you see what I mean,
4 did I explain --?

5 Q But the extrapolation
6 theory falls off as you go north?

7 A Yes, and I think that
8 is indicated.

9 Q In fact, it falls
10 off completely by the time you are in Area IV, doesn't
11 it, because otherwise your whole theory is out the
12 window.

13 A No, I don't agree with
14 that at all.

15 If you look at where I have
16 mapped, okay, in figure one --

17 Q Yes,

18 A Okay, which way did
19 I map -- which way when comparing it to Area I,
20 Area II, Area III and Area IV, which way did the
21 mapping take place, east-west. Okay, therefore I
22 am extrapolating east-west from the Area I, Area II,
23 and Area III and Area IV, and I have not indicated
24 at all that I have mapped further north or further
25 south and therefore I have not extrapolated from
26 that.

27 Q I am not sure that
28 I totally understand that --

29 A Should I go over it --

30 Q No, that is okay, thanks.

N.W. Rutter

Cross-Exam by Hollingworth

Lastly on page nine you

A Okay, this is the

Q Yes, sir.

A Okay, what I am really

So really what I am saying by

N.W. Rutter
Cross-Exam by Hollingworth
Cross-Exam by Scott

1 Really, all I'm going on
2 is available air photo interpretation reports that
3 are available, also the open file maps of the Geological
4 Survey.

5 Q The ones which just
6 became available?

7 A Plus the majority of
8 which have been available for some time.

9 MR. HOLLINGWORTH: Thank you,
10 I have no further questions.

11
12 CROSS-EXAMINATION BY MR. SCOTT:

13 Q Dr. Rutter, in answering
14 one of Mr. Hollingworth's first questions, you referred
15 to work done elsewhere, I think perhaps not by you,
16 in which you said a detailed examination was made of
17 a soil section.

18 MR. ANTHONY: I don't know,
19 Mr. Scott, if that was by Dr. Rutter or Dr. Fyles.

20 MR. SCOTT: It was by Dr.
21 Rutter, I think, in answering Mr. Hollingworth.

22 THE COMMISSIONER: Maybe it
23 was Dr. Hughes yesterday.

24 MR. SCOTT: We're coming to
25 that.

26 MR. ANTHONY: Perhaps he could
27 assist me by identifying the quote and then --

28 THE COMMISSIONER: He's getting
29 further instructions. Let's hang on here.
30

N.W. Rutter
Cross-Exam by Scott

1 MR. SCOTT: Q Mr. Rutter,
2 who worked with you on this mapping program?

3 A The direct mapping as
4 far as the geologists were concerned, there was
5 Gretchien Minning, Mr. John Netterbille Miss A.N.
6 Boydell, these and myself were all members of the
7 Geological Survey of Canada. At the present time
8 Boydell is not with the survey, and Gretchien is
9 here, and Netterbille is still with the survey.

10 Now when it comes to the
11 soils investigations and the other investigations
12 that were really under the direction of this project,
13 we're talking about Les Laukulich at U.B.C., Charles
14 Churniki of the Department of Agriculture in Winnipeg.

15 Q Well, let's take Mr.
16 Laukulich, L-A-U-K-U-L-I-C-H.

17 A What was the question,
18 sir? What? I'm sorry.

19 Q Mr. Laukulich was one
20 of the persons who worked with you in your mapping
21 program.

22 A Yes, yes, he was.

23 Q And what was his
24 particular responsibility?

25 A His particular responsi-
26 bility was to detail -- I'll go back a little bit.
27 We had a certain terrain units that were mapped, say
28 glacial lacustrine deposits under a certain set of
29 conditions, latitude or drainage or something of
30 this nature, and Les in his group of six or seven

N.W. Rutter
Cross-Exam by Scott

1 people, would go in and detail the description of
2 this particular terrain unit. When I say "detail"
3 I mean he would investigate the vegetation soil
4 relationship, the type of soils from the petrological
5 sense that were found, characteristics of the surficial
6 deposits in the upper few feet, and be able to
7 characterize that particular terrain unit that we
8 mapped more clearly than what we would have done,
9 because we would have spent a lot of our time identifying
10 these different areas of different deposits.

11 Q I take it that you regard
12 that as an important part of the process by which you
13 come to know and understand the terrain.

14 A It's certainly something
15 that has to be considered. Well, it's the old story,
16 the more information, the better; but if this type of
17 work had not been done at that particular time, but
18 had been done later, you still could have made
19 conclusions on the terrain conditions in that area.

20 Q Well, doctor, I don't
21 want you to be too sensitive.

22 A I'm not trying to be.

23 Q You had it done because
24 you thought it would be useful to give yourself as
25 full as possible an understanding of the terrain that
26 you were mapping.

27 A Certainly, and the more
28 help, the more the merrier, yes.

29 Q Well, now, you spoke of
30 that in a general way as going into a particular terrain

N.W. Rutter
Cross-Exam by Scott

1 classification and characterizing it by an examination
2 of all its parts and all its processes. Is that
3 correct?

4 A Yes sir.

5 Q Yes, and you may not have
6 heard him yesterday, but are you familiar with the
7 general proposition that Dr. Hughes, and perhaps others,
8 have advanced with respect to the desirability of
9 characterization of soil beyond mere mapping
10 as you move forward in a project?

11 A Certainly, this is a
12 vital part.

13 Q It's a vital part, is
14 it?

15 A I would say so.

16 Q Yes. Well now, let me just
17 see if I understand what you did. Your function first
18 of all was to do a mapping of the hatched areas that
19 you've shown on figure 1.

20 A Yes sir.

21 Q And parallel work was
22 done in the central area and in the northern area,
23 by Doctors Hughes and Rampton.

24 A Yes sir.

25 Q Yes, and your report,
26 your written report, because of the pressures of time,
27 was not a report that covered all the mapping that
28 you, in fact did, but was simply isolated to certain
29 portions of it that you thought would be of particular
30 interest.

N.W. Rutter
Cross-Exam by Scott

1 A That is correct.

2 Q And therefore your written
3 en report beyond your mapping is related to areas 1
4 through 4, as you've described them?

5 A Yes sir.

6 Q Yes, and that written
7 report is parallel to written reports that have been
8 made by Dr. Hughes and Dr. Rampton for their areas.

9 A This is correct

10 Q Yes, and the selection
11 of areas 1 through 4 was made by you, no doubt
12 consulting with others to whom you were responsible?

13 A That is correct.

14 Q Yes. Well now, the
15 title of the report refers to the Mackenzie Transporta-
16 tion Corridor and in your evidence you have referred to the
17 Mackenzie Corridor and have capitalized it from
18 time to time. I take it that that is merely an informal
19 reference and does not connote any stipulated or
20 official or defined corridor, apart from definitions
21 that you yourself have imported?

22 A That's true.

23 Q Yes. In other words,
24 when you talk about a corridor in your evidence, you
25 are really talking about areas 1 through 4, which --
26 with which your report deals, and are not suggesting
27 that that connotes any kind of defined corridor,
28 apart from the definitions you've adopted yourself.

29 A That is correct.

30 Q Yes. Well now, if I

N.W. Rutter
Cross-Exam by Scott

1 could ask you to first of all, it's fair to say, is
2 it not, that with deletions for the purposes of concise-
3 ness and brevity, and with some alterations in order,
4 your transcribed evidence is essentially and in
5 places word for word the -- comprises the material of
6 your written report.

7 A Yes.

8 Q Yes, and I take it that
9 your written report sets out as fully and in a detailed
10 a fashion what you came to know about the areas that
11 you studied.

12 A No, I can't say that
13 that is true.

14 Q I'm sorry, about the
15 areas 1 through 4.

16 A There is certainly addi-
17 tional information on file that was certainly never
18 published, because we were under a schedule to get
19 the report out, and we put as much -- I put as much
20 as I could into it under the time limitation, but
21 certainly there's sections that have been studied
22 that are on file.

23 Q Well, I asked the quest-
24 ion because on page 9 you say, you were asked this
25 question:

26 "As a result of your experiences with the E.S.P.
27 study and your more recent work, would you indi-
28 cate what further research and study is required?"
29 Now do I take it that the E.S.P. study sets out on
30 those areas on which you comment, your views?

N.W. Rutter
Cross-Exam by Scott

1 A This is right, yes.

2 Q Yes. Is there anything
3 about your more recent work that leads you to qualify
4 or modify or change what you have said in the E.S.P.
5 study.

6 A In a general way, no.

7 Q Well now, if I could ask
8 you to turn to page 8 of your transcribed evidence,
9 in the middle of the page you respond to the question
10 that Mr. Anthony asks you, and I note that that paral-
11 lels, though it is not precisely the same, as those
12 portions of your report which are found on page 51 of
13 your report in Sections 7.4.5, and I wonder if you
14 could turn to that?

15 A Could I have that
16 page number?

17 Q 51.
18
19
20
21
22
23
24
25
26
27
28
29
30

1
2
3 A The first paragraph
4 here --

5 Q The first two paragraphs.
6 and I wonder if just so the record will be complete,
7 you could read from page 51, the first two paragraphs
8 under Article 7.4.5, headed "Views and Comments."

9 A Would you like me
10 to read the entire --

11 Q If you would into the
12 record, please?

13 A Okay, Area four
14 has three possible pipeline corridors, each one with
15 a certain advantage --

16 Q Not too fast, now,
17 please, so I will get it. "Each one ..." --

18 A "Each one with certain
19 advantages and disadvantages with respect to
20 terrain considerations."

21 Q Okay, now stop right
22 there. I understand that to mean that each of
23 the three corridors has some advantages over the
24 other and each has some terrain disadvantages.

25 A That is correct.

26 Q All right, now would you
27 go on, please.

28 A "However, the routing
29 east of the Franklin Mountains offers the fewest
30 terrain problems --

Q All right, now stopping

N.W. Rutter
Cross-Exam by Scott

1 there, it is your view which you've expressed today
2 that the routing east of the Franklin Mountains offers
3 the fewest terrain problems, is that correct?

4 A Yes.

5 Q All right, go on, please.

6 A "Although logistical and
7 economical problems arise due to the distance from the
8 Mackenzie River and Highway, the chief transportation
9 routes of the area, and the potential for environmental
10 damage on the long access route."

11 Q All right, while
12 you are not of course an environmentalist, per se
13 I take that what you are acknowledging there is that
14 in your judgment under the heading "Views and
15 Comments", as made in the E.S.P. study, the east of
16 the Franklins route, apart from its terrain implica-
17 tions has logistical and economical problems that
18 you recognize and has adverse environmental problems
19 that you also recognize although you are not an
20 expert in those fields?

21 A That is correct, yes.

22 Q Now, would you go on
23 please.

24 A "Moreover, if a pipeline
25 were routed east of the Franklin Mountains in this
26 area, it logistically should continue northward east
27 of the mountains, across the Bear River and would
28 not return to the Mackenzie River until it reached
29 Fort Good Hope."

30 Q Now, stopping right there,

1 do I understand that to mean that once your line has
2 got us behind the Franklin Mountains if makes
3 really no sense to be there unless we go north
4 behind the Franklin Mountains beyond the mapping
5 area with which you were concerned.

6 A That is correct.

7 Q So that to put it
8 another way, if it were the view of somebody else,
9 I don't know who, that one would not want to go
10 further north behind the Franklin Mountains in the
11 central mapping area, if that were the view, you would
12 not see any particular advantage to going behind
13 the Franklin Mountains for the area in which you
14 mapped.

15 A Certainly not.

16 Q Certainly not. All right,
17 now, would you read the next paragraph.

18 THE COMMISSIONER: So that
19 unless you can carry right through with that route
20 behind the Franklins to Fort Good Hope, it is not --
21 that is not viable.

22 A Let me say this: you
23 have to continue east of the mountains north of my
24 area. Now, if you come out at Fort Good Hope, and
25 I won't comment any further on it, you have to probably
26 re-enter the area and I am not quite sure of the
27 best place for this, but you would certainly have to
28 continue north out of my area east of the Franklins,
29 yes.

30 MR. SCOTT: but Dr. Putter, as
Q NO,

1 I understand it, if someone else, whose judgment you
2 respected, was of the view that there was no particular
3 advantage and perhaps some disadvantage in continuing
4 north behind the Franklins, you would say, as a
5 practical man, "Well, there is no point getting
6 behind the Franklins in the first place."

7 A YOU would have to
8 convince me of this, yes.

9 Q But he would have to
10 convince you about his views of the central area.

11 A That is right.

12 Q All right, but you
13 haven't mapped that area.

14 A No, I haven't no.

15 Q But if it was the view
16 of the persons who have, you would say, well, if that
17 is the best scientific view, I should never have got
18 them behind the Franklins in the first place, because
19 it doesn't make any sense to go behind the Franklins
20 for a hundred miles.

21 THE COMMISSIONER: That is on
22 the assumption that you were persuaded that it wasn't
23 feasible to carry on north of the Blackwater River?

24 A Thank you, yes, I will
25 agree with that.

26 THE COMMISSIONER: All right.

27 MR. SCOTT: All right, now,
28 could you read the next paragraph, please.

29 A "The big advantage of the routing
30 east
/of the Mackenzie and west of the Franklins is the

N.W.R utter
Cross-Exam by Scott

1 proximity to the river and highway. Construction
2 costs will certainly be lower and access roads will
3 be at a minimum. As stated above, the terrain for
4 the most part is poor consisting of ice-rich
5 lacustrine silt and clay and bogland. "

6 Q Thank you very much.

7 Now, on the upper part of page five of your
8 evidence you provide some detail --

9 THE COMMISSIONER: Excuse me,
10 do you have a copy of this for the court reporters,
11 from what you are reading?

12 MR. SCOTT: Of the evidence?

13 THE COMMISSIONER: No, this
14 thing. We can provide them with one.

15 MR. SCOTT: We can provide
16 them with one. I am finished with it now, Mr.
17 Commissioner.

18 THE COMMISSIONER: Oh, I see.

19 MR. SCOTT: On the upper
20 part of page five, without reading it all, you
21 provide some details of terrain conditions along
22 your suggested route north of Willowlake River and
23 north to the northern limit of your mapping area
24 near Blackwater Lake. Now, I take it from what you
25 say in this paragraph that this area involves quite
26 a lot of good ground for pipeline building and a
27 small amount of not so good ground for pipeline
28 building including peat lands, what we have come to
29 know as speckled bog and so on.

30 A Yes, sir.

N.W. Rutter
Cross-Exam by Scott

1 Q Yes, so that what we
2 have is a mixed terrain and a route here like a route
3 anywhere would have to be chosen with care to
4 avoid difficult areas.

5 A That is correct,
6 yes.

7 Q Now, you mention in the
8 middle of the top paragraph on page five a major
9 fluting field and you say, and I am quoting, "it
10 should be possible to locate lines in relatively
11 well-drained parts of these flutings"

12 Have you found that?

13 A Yes.

14 Q NOW, I take it that
15 you mean by that that these are long, straight
16 ridges of glacial till which running parallel to
17 where you think the pipeline should go.

18 A There is glacial till
19 involved as well as poorly resistant bedrock. That is
20 right, yes.

21 Q But the flutings, --

22 A Yes --

23 Q -- run parallel to
24 the tentative pipeline route that you are talking
25 about?

26 A That is correct, yes.

27 Q And if I understand you
28 correctly, you're suggesting a routing along the crests
29 of these flutes or ridges,

30 A This is a possibility, yes.

N.W. Rutter
Cross-Exam by Scott

1 Q Well, that is the possi-
2 bility that you have directed us to, isn't it?

3 A That is my way of
4 thinking is the most preferable way of doing it --

5 Q But that is one of
6 the reasons why you think east of the Franklin is good?

7 A Yes.

8 Q Well, now, in a general
9 way can you help us by telling us in that situation
10 in the area that you have mapped, how many miles
11 as a maximum and how many miles as an average
12 would take advantage of these flutes?

13 A Well, I would say in
14 absolute terms it is difficult, it depends on exactly
15 where you put it, but certainly if you follow the
16 crest of the flutings in that particular area, you
17 are going to perhaps 80% of the position of the
18 pipe will be in fairly ice-free, well-drained conditions.
19 Now, I didn't sit down and measure each one, and
20 determine where you would be in a well-drained area
21 and where you wouldn't be.

22 Q Well, let me ask you
23 one other question and see if you can help me.

24 As an average or as a maximum,
25 how many miles do you think that you could stay
26 on one flute before you would have to move over
27 to another one?

28 A You could stay
29 one one flute -- if you picked out the largest flute
30 in the area you could stay on that the entire distance.

1 It could be as many as six or seven or eight miles
2 or something of this nature.

3 Q What is the average?

4 It would be a pretty remote possibility, wouldn't
5 it?

6 A Well, the average,
7 no, well the average length of the flute, you could
8 say on a mile, a mile and a half or something of this
9 nature or less. You get on some flutes that are
10 very extensive outside the area. They vary in
11 size and I don't think saying the average really
12 helps you too much.

13 Q No, but the problem as
14 I understand it is that you want to, where possible,
15 take advantage of these flutes.

16 A Yes.

17 Q Because they are high
18 and they are dry.

19 A Right.

20 Q But when you have
21 run out of a particular flute, you then have to go
22 down into wet and less satisfactory terrain in order
23 to move up or over or sideways to the next one.

24 A This is true.

25 Q Now, what I am asking
26 you really is what percentage of your route, in general
27 terms, is going to be on the flutes and what percentage
28 of the route is going to be in the lowlying wetter land
29 getting to them?

30 A Well, as far as east of the

N.W. Rutter
Cross-Exam by Scott

1 east of the Franklin, or south of the Blackwater
2 River and north of the Willowlake, we are talking about
3 perhaps 80% of the country is in fluted, true
4 fluted terrain and of that 80% you could probably
5 stay on fairly dry country for, say, 60% or 70% in
6 my opinion.

7 Q All right, well, then
8 it would be your estimate that 60% to 70% of the
9 route could be on the dry flutes and the 30% or 40%
10 would be in the lower land getting to them.

11 A This is a rough
12 estimate, but it is --

13 Q All right. Well, now,
14 how much data is there at hand at the present time
15 relating to the quantity of ground ice present in
16 the till ridges?

17 A From a subsurface point of
18 view from a -- there is very little, except from --
19 once again it is this business of seeing a number
20 of cuts as well as having some data from other
21 areas where there has actually been fill. Drumlins
22 have been used for gravel pits or for fill pits and
23 we have been able to take a look at the core
24 of the drumlin and the flutings themselves, but
25 generally speaking, no, each flute hasn't been
26 looked at, but I don't think it is necessary to
27 draw that conclusion.

28 Q Well, is it correct
29 to say, as I understand your evidence that in
30 terms of data there is very little.

1 A Hard data, you could
2 say that.

3 Q Yes, now how much
4 data is there relating to the peat lands, relating
5 to the presence of ground ice in the peat lands and
6 the wetter sites between the flutes?

7 A Very little data on
8 that.

9 Q I take it that it is
10 pretty obvious from your map of area four that in
11 terms of concrete data the east of the Franklin
12 route has, I think much, much less data than the
13 route that is between the river and the Franklin.

14 A Less, hard data, yes.

15 Q And indeed I think
16 your sheet shows that there are five in the
17 peatlands east of the Franklin which are designed
18 to or which do produce information about ground
19 ice.

20 A Yes, they do.

21 Q Yes, and in each one of
22 them, for what it is worth, ground ice was discovered.

23 A The investigations were
24 based on locations that we were sure that we were
25 going to find ground ice. The investigation was
26 to find out the thickness of the ground ice and to
27 see if it extended into the terrain below. So
28 we picked out the areas of ground ice that we
29 felt that we could predict from air photo interpretation
30 because of the vegetation characteristics.

N.W. Rutter
Cross-Exam by Scott

1 Q I am not criticizing it,
2 Geologists are just like lawyers/^{and} ask questions because they
3 think they know the answers, but I take it that what
4 you found is you picked five areas in which you
5 suspected you might find ground ice and sure enough
6 you found ground ice.
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N.W. Rutter
CrossExam by Scott

1 A But we wanted the
2 characteristics of the peat within this ground ice
3 also. In other words, a vegetation study in areas that
4 we thought ground ice was present.

5 Q On the bottom part of
6 page 8 of your written evidence, would you turn to
7 that for a moment, please? This, I think, is my
8 last question. You respond to a question that Mr.
9 Anthony asked you about the Ebbutt Hills. Now we've
10 had earlier testimony about the Ebbutt Hills both
11 from representatives of Arctic Gas and from representa-
12 tives of Foothills, and on March 12th Mr. Gibbs was
13 cross-examining Dr. Mollard about the Ebbutt Hills,
14 and I think he pointed out to Dr. Mollard -- or
15 Dr. Mollard pointed out to him, I forget which --
16 that there was slope failure potential on the south
17 slope of the Ebbutt Hills in the vicinity of the
18 Arctic Gas proposed route.

19 A Could you repeat that
20 last statement?

21 Q In an exchange -- you
22 weren't present, of course -- between Mr. Gibbs and
23 Dr. Mollard, who appeared for Arctic Gas, it was
24 pointed out to Dr. Mollard that at the south slope
25 of the Ebbutt Hills there was slope failure potential
26 in the Canadian -- in the neighborhood of the Canadian
27 Arctic Gas route. Now I take it that you would be
28 familiar with the existence of that.

29 A Of the Ebbutt Hills and
30 the terrain conditions, yes.

N.W. Rutter
Cross-Exam by Scott

1 Q And that particular con-
2 dition, the potential for slope failure.

3 A Yes sir.

4 Q Yes. Now, are you able to
5 comment on the real potential for slope failure at that
6 location?

7 A I'm basing my judgment
8 in that answer on my experience in the area with similar
9 slopes and terrain conditions. It's my opinion that
10 I can't get that excited about the Ebbutt Hills when
11 you consider the other problems that may arise in
12 construction in other areas, that's all.

13 Q Well, what I'm getting at
14 is in view of the potential for slope failure there,
15 what construction hazards might we anticipate at that
16 location?

17 A Well, with the exposure
18 -- depending, I suppose, on the detail of investigation
19 in general terms I would say that on exposure of the
20 material on the south side, if you have intense rains,
21 you have a particular problem with spring runoff
22 -- it is vegetation free for a certain extent of
23 time, but erosion could take place because fine-grained
24 till matrix is certainly governing and slope failure
25 could occur. It depends on engineering practices,
26 but if you get a vegetation cover over that fairly
27 fast, or you construct -- certainly you can be constructing in
28 winter, you might be able to prevent failure, a slope
29 failure along there. To me it's a minor problem
30 when considering the ice-rich deposits in other areas.

N.W. Rutter
Cross-Exam by Scott

1 Q Well now, just one
2 other matter that relates to previous evidence.
3 In page 3 of your evidence, of your prepared evidence,
4 at the bottom of the page where you're describing the
5 major terrain hazards in the area, you mention that
6 organic deposits with high moisture content consisting
7 of frozen bogland and unfrozen fenland exist that
8 are subject to collapse upon thawing, and frost
9 heaving upon freezing. Do you see that?

10 A Yes sir.

11 Q Well now, at this Inquiry
12 we've had a good deal of evidence about pipeline
13 operations and construction in this sort of terrain,
14 that is the problems of chilling or non-chilling with
15 thaw settlement. How would you characterize, in
16 areas like that, the problems that may exist in
17 attempting construction?

18 A Well, if you mean
19 going through a fen or a bogland and you're antici-
20 pating -- and it's a chilled pipeline you're consider-
21 ing, one of the problems I think^{of} immediately, sure you
22 can put weights on the pipeline, you can weight it,
23 but by the same token if you begin to freeze the terrain
24 the fen area between the bogland you can disrupt the
25 drainage, of course. If you disrupt the drainage
26 you may form an impermeable dam for many miles that
27 is certainly going to affect the terrain, you might
28 say down-slope from the pipeline, and you can go on
29 and on of the possibilities of all of a sudden freezing
30 water in an area that is adjusted to a certain

N.W. Rutter
Cross-Exam by Scott

1 environment. I don't know what you want.

2 Q Let's see if I can zero
3 in precisely on the problem. You're familiar with
4 the expressions:

5 "Speckled bog,"
6 are you?

7 A Yes.

8 Q I know it's unscientific
9 but --

10 A No.

11 Q -- that characterizes
12 the area that I've described for you and which you've
13 referred to on page 3.

14 A Yes.

15 Q Yes, all right. Now it
16 is proposed that a pipeline should be constructed
17 through such areas, and that the pipeline will be
18 chilled and that the construction will be done in the
19 winter. Now what I would like to ask you is, from
20 your experience on the basis of your experience, can
21 you outline for us the kind of problems that that
22 construction may have to confront?

23 A The construction itself?

24 Q Yes.

25 A Well, I think, first of
26 all, the behaviour of the peat bog itself is not fully
27 understood, certainly going from a fen area into a
28 bog area; but one of the problems, because in these
29 fen areas if you're going to construct in the wintertime
30 unless you have investigations, you don't know how to

N.W. Rutter
Cross-Exam by Scott

1 what depth freezing has taken place in the fen areas,
2 and you could be in one of these situations that you
3 start constructing in the winter into an area that is
4 not frozen. Well, if you constructed in an area
5 that is not frozen, in a fen area, you can imagine
6 the trouble. You could lose your equipment, I suppose,
7 in the fen. So there's this sort of thing. If you
8 have more information on the depth of freezing, the
9 time of the amount of snow cover that could certainly
10 affect how thick the ice might be in a fen area, and
11 you could go on and on. I just don't think it's that
12 well understood. But as far as a construction problem,
13 there's one right there, you could lose your equipment.

1 Q Is this an instance
2 in which detailed characterization of the soil,
3 not only for soil composition, but with respect to
4 all its processes would be appropriate?

5 A Certainly.

6 Q Would it be prudent to
7 attempt construction, in your opinion without
8 such characterization.

9 A I wouldn't, no.

10 MR. SCOTT: Those are all
11 the questions that I have, thank you, Dr. Rutter.

12 THE COMMISSIONER: Any
13 re-examination?

14 MR. ANTHONY: No further
15 questions.

16 THE COMMISSIONER: Well,
17 thank you very much, Dr. Rutter, we --

18 A May I make one more
19 comment?

20 THE COMMISSIONER: YES.
21 Carry on.

22 A One thing I would
23 like to say as far as this business about hard data
24 and the availability of borehole data on the
25 west side of the mountains and the lack of data on
26 the east side. Now, this has been stressed, that
27 do you really know what is going on in there. I
28 just would like to say that the Geological Survey in
29 a hundred years of mapping it is only very recently
30 that they have had enough budget or they have really

N.W. Rutter

1 bothered to do detailed work in the subsurface through
2 drilling, in other words, most of the maps in the
3 report of the Geological Survey in the surficial
4 mapping is based upon surface exposures and
5 what is seen in the field and the interpretation
6 of that. It is only very recently that you have
7 this sort of information. So earlier my comment,
8 there is hundreds of publications, good ones, that have
9 characterized the terrain without any subsurface
10 data at all.

11 MR. SCOTT: Well, Dr. Fyles
12 tells me that that is a point that I should have
13 elicited from you in fairness to your testimony.

14 THE COMMISSIONER: Well,
15 thank you very much for giving us the benefit of
16 your views on the alternate route behind the Franklin.
17 We appreciate that very much, Dr. Rutter.

18 A You are welcomed.

19 (WITNESS ASIDE)

20 THE COMMISSIONER: Before
21 we adjourn, on this matter of the Inquiry schedule
22 for the remainder of this year, the week of Monday,
23 November the 10th presents us with a problem because
24 Tuesday, November the 11th is Remembrance Day. I
25 am advised that that is an official holiday here in
26 the Northwest Territories. I think that it being
27 the solemn occasion that it is, we ought not to
28 sit on Tuesday, November the 11th, and so that would
29 mean coming up here on Monday the 10th if we were
30 to follow our usual schedule, simply to sit in the

1 afternoon and the evening, so the counsel might
2 think about that and you might prefer to begin on
3 Wednesday November the 12th. If we were to do that
4 I would prefer to start in the morning of Wednesday,
5 November the 12th. It would mean that some of use
6 would have to travel on Tuesday evening, but it
7 would mean that we could try to recapture the time
8 missed if we didn't sit Monday and Tuesday.
9 At anyrate you might all consider that and just
10 speak to Mr. Scott informally over the next day
11 or so and we will try and work it out.

12 MR. SCOTT: I qualify my
13 earlier observation that we may finish phase II and
14 III by Christmas.

15 THE COMMISSIONER: Well, we
16 will finish Phases II and III by Christmas. Anyway,
17 I understand that Mr. Fraser of the C.B.C. has to
18 march in a parade on Remembrance Day and we wouldn't
19 want to deny him that opportunity of rehabilitating
20 his image here in Yellowknife, so we will adjourn
21 until two and we will hear Dr. Roed at two.

22
23 (PROCEEDINGS ADJOURNED)
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M.A. Roed

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MURRAY A. ROED, sworn

MR. ANTHONY: Mr. Commissioner,
if you would like , I can proceed.

THE COMMISSIONER: Sure.

MR. ANTHONY: I apologize
for the delay in getting a large number of maps on
the wall. Dr. Roed is on the stand and has been
sworn.

Before he gives his evidence
in chief I would like to do two things. First, a
synopsis of evidence was prepared and sent out to
all the participants in anticipation of him appearing
at the Whitehorse hearing. I filed that synopsis
with Miss Hutchinson and can be marked as an
exhibit.

Subsequent to that, we
prepared a complete statement of evidence and sent
that out to the participants two weeks before
this hearing and that similarly has been circulated
and will be marked also as an exhibit.

In addition to that, and
I have advised some of the counsel that are here,
I would like to table a report which is the substance
of Dr. Roed's evidence. For various reasons the
preparation of evidence sometimes has to be brought
down into a report form to satisfy others and we
have done so with respect to Dr. Roed's evidence and
his evidence that he is giving in the synopsis that
was sent out is in fact this report. The only additions
are some inside or inhouse studies that he had done in

M.A. Roed

1 preparation of his evidence for the Inquiry referring
2 to some data which he perhaps would have to refer to
3 in cross-examination or verification of any evidence
4 he wished to give.

5 This report is definitely
6 hot off the press. Dr. Roed brought it in with
7 him this morning and that is why it was not either
8 listed or available before now, it was just finished.
9 The only comment I would like to make further on that
10 is that 'at one time we had anticipated, or the
11 Northern Assessment Group had anticipated besides
12 the Terrain Analysis Study done by Dr. Roed to
13 do an environmental overview of these alternatives and
14 provide that evidence for various reasons that could
15 not go forward. So the report has as an appendix the
16 rough draft of that report as it was prepared at
17 that stage and that part is not being presented as
18 evidence before the Inquiry. Dr. Roed is not going
19 to be referring to or relying on the environmental
20 evidence because we are not going to be calling
21 environmental witnesses. He is dealing with the
22 substance of the report which is the Terrain
23 Analysis Study.

24 A Supplemental list of
25 reports is was to be sent in the mail and I imagine
26 it hasn't been, but will be available to the
27 participants, in which case this report will be
28 listed. I would anticipate that since the evidence
29 is in fact the substance of the report, that there
30 would be no problems. If any of my friends feel that

1 there is anything in the report that bothers them,
2 we will of course have to make Dr. Roed available
3 for any further questioning.

4 MR. SCOTT: Mr. Commissioner,
5 could I ask two questions, first of all, the
6 -- my friend has filed two transcriptions of evidence
7 in chief. They are not precisely the same. May I
8 ask which he is going to go through today?

9 MR. ANTHONY: Mr. Commissioner,
10 the synopsis of evidence that was prepared and sent
11 out in anticipation of giving evidence at Whitehorse
12 was on the basis of evidence called at that time.
13 When it was obvious evidence was not to be led by
14 Dr. Roed because of timing problems, Dr. Roed went
15 back and has done some further work and the evidence
16 to be led is the evidence that was sent out to
17 the participants two weeks in advance of his
18 attendance at this time. That evidence is found under
19 heading, "Alternate Routes in the Mackenzie Valley,
20 Canadian Arctic Resources Committee, Yellowknife",
21 and that is in fact the evidence that will be led
22 at this time.

23 MR. SCOTT: A second
24 question, Mr. Commissioner, is does my friend have
25 any copies of the report, of the bound report which
26 he wants to make an exhibit that we can look at
27 before we cross-examine?

28 MR. ANTHONY: Yes, Mr. Commissioner, I have a number of copies. I have provided,
29 I thought to most counsel, and I obviously have missed

1 Commissioner Counsel and I will make that available
2 to him now. There are a number of copies, I think
3 for the other counsel and one has been left with
4 Miss Hutchinson as an exhibit.

5 (RESUME, LIST OF REPORTS AND SUMMARY OF EVIDENCE OF
6 DR. M.A. ROED MARKED EXHIBIT 293)

7 (REPORT, ALTERNATE TRANSPORTATION ROUTES AND CORRIDORS
8 GEOCONSULT LTD. MARKED EXHIBIT 294)

9 MR.ANTHONY: If we can then
10 proceed to the substance of the evidence this
11 afternoon.

12 DIRECT -EXAMINATION BY MR. ANTHONY:

13 Q A biographical note was
14 circulated as part of the synopsis of evidence for
15 this Inquiry and I would ask that you summarize
16 your experience and qualifications as detailed in
17 those biographical notes.

M.A. Roed
In Chief

A Thank you, Mr. Anthony.

I received a B.A. and an M.A. in geology, University of Saskatchewan, in the years 1959, 1961 respectively.

Then I received a Ph.D. in geology from the University of Alberta in 1968.

I belong to the Geological Association of Canada, the Association of Professional Engineers of British Columbia, and the Canadian Institute of Mining & Metallurgy.

My present corporate affiliations is that I'm president of Geoconsult Limited, I am also present of M.A. Roed Geological Explorations Ltd., which company's activities have been entirely taken over by Geoconsult.

My earliest field experience in geology occurred during the summer of 1958 when I was a student assistant on a field party in northeastern British Columbia. This was followed in the following summer by field paleontology and geology while stationed in Inuvik, working in the Mackenzie Valley area for Shell Canada, which involved stratigraphic studies of oil-bearing rocks.

Subsequently I was employed by Shell as a geologist on field mapping projects in Northern Yukon, Mackenzie Valley, Richardson Mountains, Mackenzie and Franklin Mountains, and after that I left the Shell and undertook a test-hole drilling program for a new service called the Research Council of Alberta. Since 1966 I have been the principal geological consultant on a variety of projects in

M.A. Roed
In Chief

Western and Northern Canada, also Australia and
Carribean Islands. Specific relevant projects include
the following pertinent to this Inquiry:

During the summer of 1959

I was stationed at Inuvik, Mountain River and Yadek Lake near Fort Norman as assistant to field paleontologist, Dr. W.G.E. Caldwell of Shell Canada, presently head, Geology Department, University of Saskatchewan. My position required extensive helicopter and fixed wing trips to remote localities to collect samples that included places in the Franklin and Mackenzie Mountains, the Ramparts along the Mackenzie River, the Mackenzie Delta, Campbell uplift, and along the coast adjacent to Tuktoyaktuk Peninsula.

In 1960 I was assigned as assistant geologist to a field party in 1960 for Shell. We mapped about 18,000 square miles and I was responsible for measuring and sampling about 100,000 feet of sedimentary rocks collectively exposed in numerous sections throughout the Mackenzie and Franklin Mountains. Camps were located at Blackwater Lake and at Wrigley, plus numerous fly camps. Also I was responsible for helicopter mapping of a large area of lowland east of Blackwater Lake where I made several landings to examine the geology.

In 1961 I was a senior assistant to Shell's party in the Northern Yukon. This project involved extensive detailed field mapping of approximately 18,000 square miles. My duties consisted of all stratigraphic work plus considerable mapping

M.A. Roed
In Chief

1 by helicopter. Subsequently I was responsible for
2 structural interpretation of the entire Eagle Plains
3 south to the Ogilvie Mountains.

4 While completing a Ph.D.
5 I carried out a consulting practice in Edmonton during
6 1966 to 1968. My projects included numerous mineral
7 evaluations in the Southern Yukon, Northern British
8 Columbia, and the Northwest Territories.

9 In 1969 Operation Discovery
10 was organized, this was an exciting participation
11 exploration program but it was not carried out to its
12 fullest. It was designed to evaluate the hydrocarbon
13 and metal potential of the so-called Pasal Paleozoic
14 sand which occurs at the edge of the Shield.

15 During the period 1971 to
16 1973 I was involved in two major studies in the north.
17 The first one was the Mackenzie Highway. I was
18 assigned by the Department of Public Works to assess
19 terrain sensitivity of about 500 miles of the Mackenzie
20 Highway working in co-operation with other consultants.
21 I prepared a terrain sensitivity map for the sections
22 Fort Simpson to near Fort Norman, and from south of
23 Fort Good Hope to the Arctic Red River, all on a
24 scale of one inch equals two miles.

25 Then for the southern portion
26 I evaluated and mapped each river crossing, each
27 terrain unit, and selected and suggested designs for
28 future borrow pits. This work resulted in recommenda-
29 tions for re-routings of the proposed highway.

30 Also I conducted a granular

M.A. Roed
In Chief

1 deposit survey in the southern part and critically
2 examined all geotechnical data, including drill-hole
3 data for the final design package.
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I am particularly interested

1 in cordilleran and continental glacial deposits, and
2 post-glacial processes, and have purposely structured
3 my present company to use our geologic knowledge and
4 expertise in planning.

5 MR. ANTHONY: Mr. Commissioner,
6 along with the evidence there was a list of reports
7 and projects and a list of reports referred to and
8 relied on and these also have been tabled as an
9 exhibit.

10 Mr. Roed, would you please
11 proceed then with your presentation to this Inquiry.

12 A Mr. Commissioner, I am
13 here to present a brief on alternate routes.
14 It is my specific objective to place evidence before
15 You that will convincingly demonstrate the advisability
16 of considering routings other than those presently
17 before this Inquiry.

18 I wish to make perfectly
19 clear from the outset that my comments area
20 presented from the viewpoint of the physical environ-
21 ment, that is, my work has not included study of the
22 living environment or the socio-economic environment.

23 A major and far-reaching
24 implication of any potential transportation route
25 is that once a single facility is established, for
26 whatever reason, it is difficult, if not impossible,
27 to curtail additional facilities along the same
28 general route. Therefore, it is of paramount importance
29 that evidence be provided to prove that a proposed
30 pipeline route can withstand, or cope with, the

1 compendium of inevitable development interactives that
2 "follow the leader", and that it is the best overall
3 choice.

4 I would like to present a
5 terrain model, firstly, that would be ideal for a
6 pipeline corridor in terms of resources, terrain,
7 and engineering in permafrost terrain. Next, I would
8 like to comment on general planning guidelines in
9 connection with a study of route selection. Since Dr.
10 Leggett has already highlighted some important
11 considerations of this to you in his overview evidence,
12 I will not dwell long. This will be followed and
13 my presentation concluded by the broad application
14 of this framework to demonstrate the relative
15 merits of two potential pipeline routes in comparison
16 to the proposed Mackenzie Valley route.

17 A model route with respect to
18 terrain for a pipeline would be one which is
19 situated closest to the most abundant resources. The
20 ideal terrain unit would have low relief, and
21 would be composed of well drained erosion-resistant
22 material with the lowest potential for ice content
23 and frost heave. The terrain unit most suited in this
24 respect would be a ridge of moraine or a flute composed
25 of till.

26 If I may just diverge for a
27 moment. It will be necessary very soon to refer to
28 the earth satellite photograph, a mosaic that we have on the
29 wall up here, and at this stage I would like to
30 just say a few words about that, to introduce this

1 exhibit.

2 An earth satellite photograph
3 refers to an image that is transmitted to earth from
4 a satellite known as the earth resources and technology
5 satellite presently in orbit around the earth. One
6 of the most useful, practical aspects of images
7 received from this satellite is that they can be
8 processed into photographs such as you see on the
9 wall that depict terrain conditions over very
10 large areas. This allows consideration of regional
11 terrain features that may otherwise not be recognized
12 or which may not be defined until much more work had
13 been completed.

14 If I may now return to the
15 text, starting with my description of a flute. A
16 flute is a linear streamlined ridge mantled with
17 glacial moraine --

18 THE COMMISSIONER: Excuse me,
19 Dr. Roed, I am probably looking at the wrong thing,
20 but I am at "Model Terrain Situation"--

21 A Yes.

22 THE COMMISSIONER: And you
23 are at a "Flute", and where am I -- is this the
24 right --

25 MR. SCOTT: Half-way through
26 through the first paragraph of "Model Terrain Situation",
27 Mr. Commissioner.

28 A It is line 7 of the
29 paragraph.

30 THE COMMISSIONER: Oh, sorry,

1 carry on then.

2
3 A However, your questions
4 are quite well justified, Mr. Commissioner, because
5 there is a slight departure from the transcript
6 here. We are introducing the term "fluted moraine"
7 at this stage and it was thought advisable to include
8 all of our relevant descriptions of a fluted moraine
9 at this stage for definition purposes. Therefore,
10 part of -- I think it is page 8, is included in
11 here as an insert, a paragraph, so if you don't
12 see that part, it is on page 8.

13 I think you have before you
14 an exhibit, figure 2, which is a drawing of a flute, in-
15 dicating its general characteristics. That should be
16 referred to in this following presentation.

17 THE COMMISSIONER: Oh, yes,
18 right.

19 A A flute is a linear
20 stream-lined ridge mantled with glacial moraine. The
21 ridges or flutes are nearly straight but possess a
22 broad flexured pattern, which I will be pointing
23 out in the earth satellite photographs, individual
24 ridges are commonly one quarter of a mile wide, but
25 widths up to one mile have been observed. Relief
26 varies from ten to 250 feet higher than the surrounding
27 terrain, but the flutes are commonly 50 to 100 feet
28 high. The crests of the flutes are all well-drained ,
29 do not show evidence of ground ice and nearly are all
30 well vegetated with mixed forest growth of spruce,
birch and aspen in the area that we are considering.

1 The material forming the ridges is believed to be a
2 fairly uniform stony till which in some areas
3 may be thin and overlies bedrock.

4
5 (EARTH SATELLITE PHOTOGRAPH MARKED AS EXHIBIT 295)

6 (FIGURE 2. FLUTED MORaine OR PLAIN MARKED EXHIBIT 296)
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The origin of flutes is incompletely known at present. However, they were carved at the base of glacial ice, a portion of a continental ice sheet as it flowed northward towards the Arctic Ocean. Intervening depressions are in most cases poorly drained and contain a variety of organic and lacustrine deposits, many of which, show evidence of shallow-seated thermokarst activity.

The unique characteristics of a flute is its extent in terms of distance which in some cases can be in excess of 100 miles, as we will demonstrate. Its evenness in terms of topography and its low even relief along the crestal portion.

MR. ANTHONY: Mr. Commissioner,
so we can bring ourselves back to the text, I believe
we're now to proceed with the second paragraph on
the model terrain situation section and we'll proceed,
I think, uninterrupted from that point on.

A I'll just point these fluted marines out. I am referring to, begin about here, and extent discontinuously in this area here, this is Great Slave Lake, Mackenzie River, Great Bear Lake, Delta in this area and continue pretty well all the way up to the Hare Indian River, which is here, Fort Good Hope is here. It's broken by this area of transverse ridges here and it continues all the way up to the coast in this whole land complex that is part of the Eskimo Lakes, these conspicuous finger-like peninsulas that are sticking out in the bay here.

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In Chief

1 What we are going to be talking
2 about later on is these two linear belts of moraine
3 that extent pretty well all the way to the Arctic
4 Ocean.

5 Returning to the ideal model
6 terrain situation, the route would also possess features
7 that could be blended or would harmonize with linear
8 development of a pipeline and would contain a minimum
9 number of unfavorable terrain conditions such as
10 slopes, rivers, valleys, and high ice content, unstable
11 soils.

12 A model route would offer the
13 shortest distance in combination with the other desir-
14 able features, and would offer the least complications
15 connected to design and ease of pipeline construction.
16 Also it would contain the most abundant supply of con-
17 struction materials, water sources, sites for airstrips
18 and camps, and possess potential for access for logi-
19 stical purposes.

20 I would now like to comment
21 on a general planning framework for development projects.

22 The first planning stage.
23 Selection of a potential transportation route, such as
24 a pipeline, ideally begins with a broad resource inventory.
25 We are in this case referring to the Western Canadian
26 Arctic and the resources consist of human resources,
27 physical resources such as landforms, lakes and rivers,
28 minerals, oil, gas, and other fuels such as coal and
29 uranium, and biologic resources. Emphasis in my presen-
30 tation is placed on the general category of physical

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resources, since my training is in this field.

The immediate concern is to connect the gas and oil-bearing basin of the Mackenzie Delta-Beaufort Sea area with markets and pipeline systems in Southern Canada, and this thus defines a broad general route along which the inventory is carried out.

Following this, general engineering, environmental and socio-economic constraints are considered. Engineering issues are examined with the assistance of topographic maps, earth satellite photographs, and published data. We have just explained earth satellites, so I'll omit that section at this stage.

At this level, it is possible to eliminate the greatest portion of unsuitable terrain. Three possible transportation corridors emerge at this stage. They are the Mackenzie Valley, east of the Franklins, and Edge of the Shield routes.

These routes are shown along with a few other routes on figure 1, which I believe you have in your possession.

MR. ANTHONY: Mr. Commissioner, this is the grey-colored map. Unfortunately, it's gone to the printer a couple of times, and each time the Edge of the Shield route seems to have trouble making it to the surface. It's the one farthest east, labelled "Edge of the Shield," indicated with red dots. The section showing the fluted moraine indicates the east of the Franklin area, and the other routes are those more familiar to us, and are shown in the

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1 red line.

2 THE COMMISSIONER: Excuse me.

3 The east of the -- I see the Edge of the Shield, which
4 -- and I see the East of the Franklins route; but why
5 is the east of the Franklins route about 100 miles
6 wide? What is that supposed to be?

7 A That's the general zone
8 along which we studied for presentation to this
9 Inquiry.

10 Q But I'm sorry, Dr. Roed,
11 I just better understand where you're at before we
12 go any further. The Edge of the Shield route on this
13 map cuts through the middle of Great Bear Lake and
14 Great Slave Lake. When you traced it on the satellite
15 photograph it seemed to me to be rather more to the
16 west.

17 A Yes.

18 Q Have I misunderstood or --

19 A Well no, I apologize
20 for that. I was really pointed out the fluted moraine
21 along the east of the Franklins route at the time when
22 I pointed to the map. I may be helpful --

23 Q Well then, your route ,
24 forgive me, the Edge of the Shield marked here is the
25 Edge of the Shield, and it isn't the Edge of the Shield
26 route.

27 A It's the Edge of the
28 Shield route.

29 Q Oh, I see.

30 A The other hatched area

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1 is the east of the Franklins route or corridor, and
2 then the dotted line down the Mackenzie River area
3 is the Mackenzie Valley route.

4 Q O.K., I'm sorry. I'm
5 with you.

6 MR. ANTHONY:
7 I want to ensure that
8 perhaps others understand us too. As I understand,
9 the map is to indicate the edge of the Shield
10 corridor and the east of the Franklin corridor, in
11 broad terms, and they're outlined in the broad terms
12 indicated there. The more particular lines, of course,
13 are pipeline proposal routes which can't be depicted
14 in more particularity.
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THE COMMISSIONER: O.K..

fine.

A Continuing, the immediate concern -- oh, I think I've got all that. I'm right down at this second paragraph.

At this level it is possible to eliminate the greatest portion of unsuitable terrain. Three possible transportation corridors emerge at this stage: They are the Mackenzie Valley, Edge of the Franklins, and Edge of the Shield routes. The three corridors are then broadly evaluated again by using more or less the same data as in the previous stage, but with specific attention given to the following evaluation categories.

For example, in the resources field we would inventory and locate potential oil and gas bearing areas that were or could be of influence -- coal, uranium, base metals, precious metals, industrial minerals, adjacent or along the route or in some area of influence. The terrain would be dealt with under the type of soil, river valleys and drainage, the stability conditions, erosion processes, relief, ice content, aesthetic potential, and unique localities, such as an archaeological site, or a site of park status or similar unique physical locality.

With respect to engineering, the length of line would be considered, the relative length of line, the relief along the area, simplicity of design, ease of construction, and availability of construction materials and compressor sites, and camp

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1 sites and airstrip sites, and consideration with
2 regard to logistics and water resources. From the
3 range of physical resource combinations that may occur
4 several alternate pipeline designs may then be con-
5 sidered. The relative merits of each design can be
6 compared to expected terrain condition alternatives.

7 The second planning stage.

8 In the next planning stage, the three alternatives are
9 studied in even more detail, probably by low-level
10 photogeology first, then by field examination in
11 conjunction with test-hole drilling. All other environ-
12 mental and socio-environmental aspects would be further
13 investigated at this time. Analysis and comparison of
14 this data for all routes would provide a firm basis on
15 which to make a decision on which route to select for a
16 final phase in the planning of the pipeline.

17 The third planning stage. The
18 final pre-construction phase in planning is composed of
19 two parts -- preliminary final design, and final design.
20 The Mackenzie Valley route, the Arctic Gas prime route,
21 is at the preliminary final design stage at this time.

22 Other planning stages, of course,
23 involve monitoring during and after construction and
24 consideration of route abandonment. However, my evidence
25 will not include these stages except to emphasize the
26 importance of future potential for the suitability of
27 proposed routes.

28 As a basis for my present work
29 with respect to this planning framework I have just
30 outlined, the comparisons I am presenting have been made

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1 on studies of East of the Franklin and Edge of the
2 Shield alternatives at the level of effort required
3 for the first planning stage. There has been no detailed
4 air photo interpretation, no test-hole data, and only
5 very limited field work. Emphasis must be placed
6 as suggested by Dr. Leggett in his overview testimony,
7 and as outlined by the Pipeline Application Assessment
8 Group Report, on the importance of the first major
9 facility in this region, because it will surely estab-
10 lish the area as a major corridor. The potential corri-
11 dor must, for example, have sufficient construction
12 materials to be able to support the possible future demands
13 of say, a railroad, and a pipeline, new townsites. Also
14 it should ensure some future potential for alternate
15 use, for mineral or coal transportation, for example.
16 In short, Mr. Commissioner, we are compelled to view
17 the alternatives in terms of the future. This is impor-
18 tant in all parts of Canada, but it is particularly
19 important for Northern Canada because this region is
20 unique. It is resource-rich land with vast areas of
21 very difficult terrain inhabited by and well-known to
22 the native people.

23 It is my contention that a
24 proposal for a pipeline route must satisfy the string-
25 ent characteristics demanded in the planning model
26 presented.

27 To go onto the route altern-
28 atives in comparison to the Mackenzie Valley route.
29 As I stated, major and far-reaching implication of
30 any potential transportation route is that once a

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In Chief

1 single substantial facility is established, for
2 whatever reason, it is extremely difficult if not
3 impossible to curtail additional facilities in the
4 same corridor.

5 It is the contention of this
6 brief that the proposed Mackenzie Valley general
7 route of Canadian Arctic Gas Pipeline and Foothills
8 Pipe Line Ltd. is inappropriate for planned development,
9 and for the inevitable ancillary development that will
10 follow.. The reasons for this may be numerous, but
11 emphasis is placed here on terrain sensitivity in
12 comparison to other alternate route possibilities that
13 are far less sensitive, offer improved construction
14 conditions and are more adaptable with respect to terrain
15 capability and overall future development.

16 Present gas discoveries in the
17 delta are restricted to the western extremity of the
18 potential gas-bearing sedimentary basin, and the opin-
19 ion here is that to better centralize future distribu-
20 tion a major terminal point of a gas pipeline should
21 be located near the geographic centre of the potential
22 basin, or at about the general location of Anderson
23 River on the coast, or near the tip of Tuktoyaktuk
24 Peninsula.

25 The following general account
26 discusses two alternate corridor possibilities to
27 southern markets and offers broad comparisons of rela-
28 tive terrain sensitivity to the Mackenzie Valley route.
29 These routes consist of the Edge of the Shield route
30 and East of the Franklins route.

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1 This work is partly the re-
2 sult of my field work and my past research dating back
3 to 1959, and partly from recent research conducted by
4 myself and others, partly from my interpretation of
5 new remote sensing imagery, and partly from government
6 publications. This brief and supporting evidence was
7 requested by the Northern Assessment Group for
8 presentation to this Inquiry. The ideas and opinions
9 expressed are my own and do not reflect on any other
10 person or scientific body.

11 The Edge of the Shield
12 corridor roughly parallels the boundary of the
13 Canadian Shield and interior plains, but in Western
14 Canada almost all the route is situated just to the
15 west of the Shield terrain. That is the Canadian
16 Shield.

17 The route is the shortest
18 distance and offers the least sensitive terrain from
19 the Arctic coast to Winnipeg, and complements consider-
20 ation being given an all-Canadian Winnipeg to Montreal
21 pipeline route through Northern Ontario Shield terrain.

22 The Edge of the Shield corri-
23 dor starts at about the geographic centre of the
24 Mackenzie sedimentary basin --

25 THE COMMISSIONER: Excuse me.
26 I'm sorry, Dr. Roed. That last sentence, you say
27 the route, the Edge of the Shield route is the shortest
28 distance, that I understand, offers the least sensitive
29 terrain from the Arctic coast to Winnipeg -- you will
30 no doubt elaborate on that -- and complements consideration

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1 being given an all-Canadian Winnipeg to Montreal
2 pipeline route through Northern Ontario Shield terrain.
3 Now what are you getting at there? I'm not with you.

4 A Well, it's simply that
5 this is recognized as an advantageous corridor in the
6 Eastern part of Canada.

7 Q Winnipeg to Montreal.

8 A That's right, and it's
9 the only route that actually you can go to be on
10 Canadian soil all the way.

11 Q Well --

12 A There are serious planning
13 you know, studies going on.

14 Q Well, your route, the
15 Edge of the Shield route, in its southward route
16 terminates at Winnipeg and in that sense it complements
17 the Winnipeg to Montreal route. That's what you're
18 getting at, I take it?

1 A The implication is that
2 the same route is being planned right now between
3 Winnipeg and Montreal could be used to extend the
4 Edge of the Shield route all the way to Montreal
5 utilizing or minimizing further new pipeline route
6 selection.

7 THE COMMISSIONER: But the
8 Arctic Gas line comes down and connects to the
9 TransCanada system, so does the Foothills line. They
10 get the gas to Winnipeg one way or the other.
11 Okay fine, carry on.

12 A The edge of the shield
13 corridor starts at about the geographic centre of the
14 Mackenzie sedimentary basin on Tuktoyaktuk Peninsula
15 and travels southeastwards just west of the edge
16 of the Canadian Shield on well-drained soils. Between
17 the northern terminus on Tuktoyaktuk Peninsula, the
18 corridor extends in almost a straight line for
19 about 850 miles to near Fort Smith at the boundary
20 of the Northwest Territories and Alberta. Throughout
21 this stretch the route never exceeds an elevation
22 of 1200 feet above sea level. The only major river
23 crossing is at the Slave River near Fort Smith , but
24 the route would , conceptually, pass through shallow areas
25 of Great Bear Lake and Great Slave Lake. While the
26 corridor crosses these two great two great lakes these
27 crossings can be made at relatively shallow depths
28 not exceeding 300 feet using special construction
29 and engineering techniques presently being developed
30 and used in other major resource projects. The land

1 transportation systems of the corridor would of
2 course deviate from the conceptual route and would
3 go around both lakes. The corridor in Alberta
4 passes very close to the proposed McMurray
5 Transportation Corridor which would allow
6 coupling with this distribution centre and in Manitoba
7 the route passes within one hundred miles of
8 Brandon, a major distribution centre.

9 It is the contention in pro-
10 posing this alternate route that combined with the
11 immediate task of transporting gas to Canadian
12 markets, the Edge of the Shield route will allow the
13 creation of a major transportation corridor in the
14 future, if required, or if desirable. Because of the
15 route's location, or the corridor's location, close
16 to numerous potential mineral resources in shield
17 terrain to the east, the potential development of the
18 eastern part of the sedimentary basin in the Beaufort
19 Sea-Banks Island area, and the probable need for an
20 oil pipeline and possibly other transportation systems
21 in the near future, this corridor is worthy of serious
22 consideration. This contention is strongly supported
23 by terrain characteristics along the route since it
24 appears to present less sensitive conditions and more
25 abundant construction material throughout its entire
26 length compared to the Mackenzie Valley corridor.

27 Inherent in the Edge of the
28 Shield concept is that if a corridor is developed, it would
29 offer numerous logical possibilities for alternate use
30 in the event that oil and gas reserves became depleted.

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In Chief

1 The principal alternate use would be base metal and
2 uranium ore and concentrate transportation that poten-
3 tially occurs in this part of the Canadian Shield.
4 These products may even require a railroad, perhaps a
5 continuation of the Pine Point line which is
6 located close to the proposed route.

7 THE COMMISSIONER: Just
8 pausing there, just to orient myself, where would
9 you continue the Pine Point line, around the lake
10 to the west or to the east or what?

11 A The shortest condition
12 and the best construction condition in my opinion
13 is to the west around the narrows of Great Slave
14 Lake.

15 THE COMMISSIONER: Yes, carry
16 on.

17 A Further, extensive coal
18 deposits occur in the vast Cretaceous sedimentary
19 basin south of Franklin and Darnley Bays, and extensive
20 gypsum deposits are suspected in the Devonian rocks of the
21 Great Bear Plain. The region adjacent to the corridor
22 is also rich in potential hydroelectric power. It is
23 important to appreciate that this brief is not neces-
24 sarily supportive of any of these developments. I am
25 merely indicating the types of developments that might
26 be proposed in the future based on the resources. No
27 doubt you will be hearing more about possible developments
28 in the corridor phase of this Inquiry and therefore I do
29 not propose to discuss this aspect further.

30 With respect to terrain conditions,

1 the following brief description of terrain conditions
2 has been derived from ERTS imagery interpretation,
3 selected air photographic interpretation, examination
4 of National Topographic Maps and scientific reports.

5 Mile 0 to Mile 25: Starting
6 at the Tuktoyaktuk Peninsula to the eastern side of
7 the mouth of the Anderson River, Liverpool Bay and Wood
8 Bay, involved Arctic marine construction constraints
9 including ice scower and other near shore ice problems.

10 Mile 25 to Mile 100: --

11 THE COMMISSIONER: Excuse me,
12 you have to get across -- you have to get from the
13 Peninsual to the mainland, that is your difficulty
14 there?

15 A That is correct.

16 Mile 25 to Mile 100: Gently
17 rolling to flat terrain with 5 to 10% total area in lakes.
18 Deposits consist of thin till and windblown silt over
19 bedrock to the Pale Shale Zone in the western extension
20 of the Smoking Hills Upland. The Arctic Coastal Plain
21 is of low relief and characterized in general by a
22 remarkable series of abandoned strandlines, however,
23 this coastal terrain is dominated along the route
24 by frozen ground features the first 15 miles.

25 THE COMMISSIONER: Excuse me,
26 Dr. Roed, what are strand-lines?

27 A Strand-lines are features
28 formed as the ice retreated when the ocean was much
29 higher than it is now. They were beaches that because
30 of withdrawal of the sea and gentle rebound of the land,

1 these beaches are now abandoned. They should be ref-
2 erred to as abandoned strand-lines, and yes, that
3 is what I have there.

4 THE COMMISSIONER: Thank you.

5 A They are old beaches.

6 THE COMMISSIONER: Right, I
7 got it.

8 A This section, Mile 100 to
9 Mile 250: This section follows an extensive and thick
10 moraine deposit referred to as moraine plains, and
11 as ice-contact, and including ice - contact and moraine
12 deposits. Glaciofluvial material and well drained
13 sand and gravel is abundant and the route west of
14 Horton Lake is on an esker complex that is in the order
15 of 15 miles long.

16 Generally the terrain appears
17 well drained although in places over 10% of the total
18 area is in lakes.

19 Bedrock is mainly of the
20 Pale Shale Zone of Cretaceous age which is
21 overlain by a uniform layer of unconsolidated gravel and
22 sand unit that may contribute to the well drained
23 aspect of this northern terrain.

24 Scattered pingos occur, but they
25 are very small and widely separated relative to
26 their counterparts to the northwest. Some frozen ground
27 features were observed south of Horton Lake.

28 Mile 250 to Mile 310: Most
29 of the route here is situated on well defined moraine
30 ridges in a fluted plain. Relief is low and the crests

1 of the ridges are well drained and probably consist of
2 thin till over bedrock. Intervening depressions are
3 poorly drained and probably ice-rich.

4 Mile 310 to Mile 350: Water-
5 crossing from Clearwater Bay to Etacho Point, Great
6 Bear Lake in less than 300 feet of water.

7 Miles 350 to Mile 400: Water
8 crossing of Keith Arm, Great Bear Lake from Etacho
9 Point to the northwest tip of Leith Peninsula, in less
10 than 300 feet of water.

11 THE COMMISSIONER: What is
12 the length of each of those crossings?

13 A One is about 40 miles
14 long, one is about 50 miles long, roughly.

15 THE COMMISSIONER: So you
16 have got virtually a 100 mile long crossing of
17 Great Bear Lake.

18 A That is right.

19 Water crossings are subject
20 to detailed bottom survey and material identification.

21 Mile 400 to 700: The
22 route is situated in flat to rolling terrain that
23 is mantled dominantly with sandy surficial sediment of
24 Glacial Lake McConnell. Although clay and silt may
25 occur rarely, the most noticeable deposits are
26 strand-lines -- abandoned strand-lines again -
27 composed of sand and gravel, that are extensively
28 developed, many parallel to the route, especially
29 in the southern section.

30 Glaciofluvial deposits

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In Chief

1 such as the esker complex on the east side of Lac
2 La Marte are common . Despite its low relief, much
3 of the route is well drained and is not characterized
4 by frozen ground features.

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In Chief

1 Bedrock is deeply buried in general, but consists
2 pf Ordovician - Cambrian sandstones and carbonates
3 in the north and Middle Devonian carbonates and shales in the
4 south.
5 Mile 700 to Mile 760. The water crossing of Great
6 Slave Lake to the Slave River, Little Buffalo River
7 area in less than 200 feet of water.

8 THE COMMISSIONER: What is
9 the length of the crossing of Great Slave Lake?

10 A It's indicated in the
11 mileage of about 60 miles.

12 Q Right, O.K.

13 A Services to Yellowknife,
14 Pine Point, that is a service pipeline route to these
15 centres, Yellowknife, Pine Point, Hay River and
16 Fort Smith, some of the largest communities in the
17 Northwest Territories, have not been included in this
18 analysis. However, it would appear to be much less
19 expensive to construct feeder lines to these communi-
20 ties from this route or corridor as compared to the
21 Mackenzie Valley because of the shorter distance
22 involved.

23 Q You might for future
24 reference include Fort Resolution in that list be-
25 cause your pipeline would go right through it, at
26 least right past it.

27 A Certainly, I didn't mean
28 to leave anybody out.

29 Q Carry on then.

30 A If I may turn to east
of the Franklins corridor, examination of earth resources

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In Chief

1 and technology ~~sat~~ellite mosaic, that we have up on
2 this wall here, and consideration of the glacial
3 map of Canada, which is shown over there, led to
4 initial discovery of two extensive linear areas of
5 fluted moraine east of the Franklin Mountains. The
6 fluted moraine occurs in belts up to 80 miles wide,
7 one of which extends northerly from near Great Slave
8 Lake to Smith Arm in Great Bear Lake and the other
9 begins north-east of Fort Good Hope and stretches to
10 the Arctic Coast. As is illustrated in figure 1, the
11 red printed map. The prominent finger-like landforms
12 of the Eskimo Lakes are related to the northern-most
13 fluted moraine. Terrain within the moraine generally
14 consists of long parallel till-mantled ridges, which
15 are called flutes, with intervening linear depressions,
16 which are called grooves, again as outlined in figure 2.
17 Many flutes are remarkable for their linear continuation
18 of up to 100 miles in length. The characteristics of the
19 fluted moraine have been summarized by various research-
20 ers. The east of the Franklins corridor extends from
21 Sitidgi Lake in a south-east direction roughly
22 parallel with terrain features of the fluted moraine.
23 It passes over the saddle of Colville Hills and just to
24 the west of Smith Arm of Great Bear Lake. It goes south
25 then to the airport at the Great Bear River and then
26 south-east along fluted moraine in an almost direct line
27 passing eastwards of Keller Lake and of the Horn Plateau
28 to near Fort Providence, where it would cross the
29 Mackenzie River. From there it goes southwards to link
30 with the Rainbow Field transportation system in Northern

M.A. Roed
InChief

1 Alberta, roughly following existing highway facilities.
2 Other southern linkages are possible.

3 The fluted moraine, the
4 principal terrain type along the route, is well-defined
5 on the 1 to 250,000 scale topographic maps of the area
6 because of their streamlined form and because they have
7 completely controlled the drainage pattern in these
8 areas. The pattern of this regional flute
9 system is clearly evident on the ERTS imagery for the
10 area, as I outlined earlier and as is outlined on the
11 glacial map of Canada by representative glacial flow
12 symbols. An example of the flutes is shown also in
13 figure 12 -- I think I'll just omit that, if I may.

14 Q You went through that
15 before.

16 A Yes. Part of the northern
17 fluted moraine area is marked by abundant solifluction
18 stripes which indicate a thin active layer on gentle sl-
19 opes. Similar features have not been observed south
20 of the latitude of Fort Good Hope. An example of
21 such features is illustrated as figure C-21 on page
22 57 in a report by the Environmental Social Committee,
23 (1974).

24 The southern flute system is
25 poorly defined on the northern flank of the Horn Plateau
26 but still exists. However, the flutes here are
27 associated with the regional strand-line system of
28 raised beaches formed during high stages of Glacial
29 Lake McConnell. The strand lines are composed of sand
30 and gravel, are very low in relief, and well-drained

and are nearly continuous.

MR. ANTHONY: Mr. Commissioner, before Dr. Roed proceeds with his terrain advantages of the system, in view of the fact that he has outlined a broad corridor, and this was not followed through in the evidence that we heard this morning, beyond the area studied by Dr. Rutter, I thought it would be helpful if he gave a short mile by mile description so we've got an accurate depiction of what route he's talking about. I'd ask him to proceed with that. That is found, by the way, in the report that counsel have and you have before you on pages 15 and 16.

I should say too that the route that he has just outlined in general, this is in fact the same route, it's going through it mile by mile.

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1 A: I might also note that the
2 following mileages are just about the same along
3 both routes, so -- and they're only marked on one
4 of them, I believe, so if you'll just sort of project
5 those mileage indicators over perpendicular to the
6 line, I hope that's not too confusing.

7 Mile 0 to Mile 175. Mile 0
8 is Sitidgi Lake. Till mantled drumlinized upland
9 with topographic trends parallel to the route, some
10 hummocky moraine. Part of the terrain in this route
11 is shown in figure C-10 of Report 74-17, Environmental-
12 Social Committee (1974). Solifluction and permafrost
13 features are widespread but are minimal along the
14 crests of the numerous well-drained topographic features.
15 The route crosses a deep narrow canyon of the Kugaluk
16 River and the headwaters of Miner River.

17 Bedrock is composed of shale
18 and sandstone of the Imperial formation of Upper
19 Devonian age, but outcrops are restricted to the valleys.
20 Generally the route is well-drained in consideration
21 of its occurrence in the continuous permafrost zone.
22 It is preferable to its correlative counterpart on the
23 Mackenzie Valley route, because of this, and because
24 the terrain is lower in relief.

25 Mile 175 to Mile 300. From
26 about Carcajou Lake to the headwaters of the Hare Indian
27 River the route passes over the saddle of Colville Hills.
28 This is a moderately irregular till mantled glaciated
29 upland, moderately drained with considerable scope for
30 a low relief construction route.

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Mile 300 to Mile 600.

Broadly curvilinear fluted moraine area. Flutes are very well defined in most areas, appear well-drained with minimal frost action potential. Crest of the flutes are very gentle in grade and short intervening connecting depressions are poorly drained. On the north flank of the Horn Plateau, a combination of fluted moraine and glaciolacustrine sand deposits or strand lines allow selection of a well-drained route that offers greatly reduced construction problems in comparison to its counterpart along the Mackenzie River Valley route.

Crossing of Great Bear River is considered to be a straight-forward relatively simple operation because of low relief features flanking through the river.

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Bedrock in the northern section is shale and carbonate of Devonian to Ordovician in age. Some karst features occur north of Great Bear River

Balkwill, in 1971 describes part of this route as follows:

"Fluted topography is especially pronounced in the northwesterly trending, arcuate drainage basin occupied by Johnny Hoe, Porcupine and Whitefish Rivers."

Much of the entire section is similar.

Mile 600 to Mile 700: The route around the Horn Plateau to Fort Providence and across the Mackenzie River is a glaciolacustrine and till plain of low relief and generally poorly drained. Careful selection should ensure a good route especially if strand-lines can be followed. Crossing of the Mackenzie River may complement consideration of a bridge, if not, particularly severe ice erosion can be expected at this location due to the influence of outlet waters from Great Slave Lake.

Mile 700 to the Alberta border. The overall difference in terrain suitability for this section of the route that skirts the Cameron Hills compares to its counterpart segment along the Mackenzie Valley route, is that the East of the Frankline route eliminates traversing the poorly drained upland that straddles the Northwest Territories - Alberta border and eases access by following the Mackenzie Highway.

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1 I would like to summarize
2 the terrain advantages of fluted moraine. The recogni-
3 tion of a nearly continuous belt of fluted moraine
4 leading all the way to the Arctic Coast prompted
5 consideration of this feature for pipeline construction.
6 There are numerous terrain advantages as follows:
7 There are only two major river crossings, the Great
8 Bear River, near the airport, where the terrain appears
9 ideal for construction, the Mackenzie River at
10 Fort Providence, and two minor river crossings, one
11 across the canyon of Kugaluk River and one across
12 the Hare Indian River near its headwaters. Several
13 possible crossing sites occur in these valleys.

14 South of Great Bear River
15 terrain conditions along the flutes are such that a
16 chilled pipeline may not be required, since this terrain
17 does not appear to be susceptible to thermokarst
18 subsidence.

19 Flutes, or similar drumlinized
20 landforms, especially at the crest are very well drained
21 and composed primarily of stony erosion resistant
22 till that would not be susceptible to
23 serious frost heave. However, short connecting
24 sections between discontinuous flutes may require special
25 drainage and construction considerations. Except for
26 short sections between Lac Belot and Fort Good Hope
27 and Sitidgi Lake to Iroquois River, the route
28 parallels drainage which eliminates much concern about
29 ponding and icing.

30 Throughout the moraine belts,

1 granular deposits are common either in the form
2 of glaciofluvial material, or, in the south, sand and
3 gravel of the beach strand-lines.

4 Since there are fewer terrain
5 and consequent environmental problems, the engineering of
6 final design is simplified. This is an important con-
7 sideration if a pipeline is to be constructed in as
8 short a time as possible.

9 In terms of length, the East
10 of the Franklins route is about the same distance from
11 Sitidgi Lake to the Alberta border as compared to the
12 Mackenzie Valley route.

13 Lastly, the East of the
14 Franklings corridor is much more suitable for a major oil
15 pipeline alignment in that: -- a major oil pipeline
16 alignment, in that: Terrain stability problems associa-
17 ted with construction and operation of a heated
18 oil pipeline are significantly less, and a major oil
19 spill resulting from an oil pipeline rupture could be
20 more readily contained along a much greater portion of
21 the line in the East of Franklings as opposed to the
22 Mackenzie Valley.

23 I would like to say something
24 about logistics now. Logistics is a potential major
25 problem of these alternative corridors. The particular
26 logistical concerns include: increased costs in
27 transporting pipe from staging areas to the pipeline
28 right-of-way, water supply along the route, aggregate
29 and gravel supply, and air transport.

30 It is important to remember

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In Chief

1 however, that the East of the Franklins Route still
2 capitalizes on the Mackenzie River transportation
3 benefits. Staging areas could be located near
4 Fort Providence, on the Great Bear River at the
5 Bennett Field airstrip at Loon River, and at Inuvik.
6 From these nearly equally spaced points,
7 sections of pipe could be moved along winter roads to
8 the right-of-way.

9 Early estimates of water
10 supply along the proposed corridor have not indicated
11 any sections which would present insuperable water supply
12 problems. Similarly, while aggregate supply, specifically
13 gravel, is scarce in the northern section, the supply
14 does not seem to be any more scarce than along
15 the northern end of the Prime Route.

16 Finally, while some new
17 airports might be required to supply pipeline construction
18 operations, use of the alternative corridors would
19 not conflict with public passenger service along
20 the Mackenzie Valley.

21 While further analysis and
22 research is required to resolve potential problems
23 of logistics and supply, it is suggested that the
24 disadvantages would be outweighed by the other
25 advantages of these alternate corridors.

26 In conclusion, information
27 presented in this report --

28 THE COMMISSIONER: Dr. Roed,
29 I think we will take our midafternoon break now, if you
30 don't mind and then we will return refreshed to consider
the conclusions.

(PROCEEDINGS ADJOURNED)

M.A. Roed
In Chief

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. SCOTT: If we could re-convene and hear Dr. Roed's evidence in chief at least today, I know there's a community hearing tonight and I suggest that perhaps we break after his evidence in chief.

THE COMMISSIONER: Well, carry on, Dr. Roed.

A Thank you. In summary, information presented in this brief suggests that more appropriate terrain for pipeline construction occurs along the two possible alternate corridors as compared to the Mackenzie Valley corridor. The major items of comparison are summarized in a graphic form in Table 1. Exhibit of which you have.

MR. ANTHONY: Mr. Commissioner, this is the document, Table 1, which is these series of dots illustrating different terrain considerations.

THE COMMISSIONER: What's that last one length to Rainbow.

A The general area of Rainbow Oil Field in Northwestern Alberta.

This table is an attempt to summarize my conclusions which I am about to give, in a simplified form.

The east of the Franklins corridor has the best terrain advantages of the three, is about the same length as the prime route to the Alberta border, and very likely has the terrain capability that would allow corridor development in harmony with social, biological and physical resources.

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In Chief

1 The edge of the Shield corridor
2 is best suited for long-range development of the Western
3 Arctic in terms of supplying minerals from the Shield
4 and as an alternate or complimentary use in a multi-
5 purpose corridor. It is also strategically located
6 in relation to future potential oil and gas source in the
7 Beaufort Sea-Banks Island area.

8 The Mackenzie Valley corridor
9 is known to have numerous sensitive terrain aspects as
10 documented repeatedly in the Pipeline Assessment Group's
11 report. My strong impression of the contents of the
12 Pipeline Assessment Group's Report is that in nearly
13 every respect the Mackenzie Valley is a distinctly
14 inappropriate place to build a pipeline. However,
15 the Group's report stops short of firmly recommending
16 consideration of additional alternatives.

17 Information presented in this
18 brief contends that alternates to the Mackenzie Valley
19 should be considered. It has been suggested that the
20 two alternate corridors described are more appropriate
21 than the Mackenzie Valley in terms of terrain sensi-
22 tivity and overall capability to accommodate present and
23 future development.

24 In terms of priorities, I would
25 suggest that the east of the Franklins corridor be given
26 immediate attention. A preliminary overview of this
27 possible corridor alternative would include the follow-
28 ing: air photo interpretation of a 50-mile wide zone
29 along the corridor; aerial reconnaissance; compilation
30 of existing information; appraisal of socio-economic

M.A. Roed
In Chief

1 implications; an overview of environmental issues;
2 general logistical and resource supply analysis; and
3 futuristic overview of land use and of alternate uses.

4 In my view, Northern Canada is
5 in a critical need of a comprehensive examination of
6 long-range planning, or as it is now referred to,
7 "futures research." I would recommend a major study
8 wherein all resources, physical, environmental and
9 social, and all types of transportation are comprehen-
10 sively examined in detail. This study would serve as
11 a synthesis of all possible transportation activities
12 or land uses within the corridor, many of which, such as
13 air transport, are being planned in isolation. This
14 would allow a flexible framework for planning the
15 future of Northern Canada.

16 While undoubtedly much more
17 research is required before it could be stated with
18 any degree of certainty that one of the two alternatives
19 is, in fact, the best route --and I am thinking principal-
20 ly of environmental and socio-economic evidence --
21 from purely a terrain point of view, both alternatives
22 have obvious advantages that warrant further study be-
23 fore a pipeline route down the Mackenzie Valley is ap-
24 proved. Thank you very much.

25 THE COMMISSIONER: Thank you,
26 Dr. Roed.

27 MR. CARTER: Mr. Commissioner,
28 may I just ask one question by way of clarification of
29 the witness, and it will assist us in preparing our
30 cross-examination?

M.A. Roed
In Chief

1
2 Q Dr. Roed, on your east
3 of the Franklins route, could you tell me which side
4 of Sitidgi Lake you proposed that that route would
5 go?

6 A We haven't defined it,
7 you know, in that great a detail. Generally on the
8 east side there, or you can bring it in from the south.
9 But it would depend on, you know, actual detailed
10 terrain conditions, existing on the ground as it is
11 now. We just picked Sitidgi as more or less sort
12 of a starting point generally.

13 Q I see.

14 A Whether it's the north
15 end or the south end, this study hasn't specified.

16 THE COMMISSIONER: Well, I
17 think we'll adjourn now because we have a community
18 hearing for the people of Latham Island tonight, and
19 in fairness to them, I think we should get some rest
20 before we go down there.

21 So tomorrow we'll start at
22 ten in the morning. So we're adjourned till ten in
23 the morning.

24 (MAP OF POSSIBLE ALTERNATE ROUTES MARKED EXHIBIT
25 297)

26 (TABLE 1, RATINGS OF ALTERNATE ROUTES, MARKED
27 EXHIBIT 298)

28 (PROCEEDINGS ADJOURNED TO OCTOBER 23, 1975)
29
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